Project B-209

THE FEASIBILITY OF PRODUCING WOOD PARTICLEBOARD IN GEORGIA

Prepared for

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Summary

The production of wood particleboard in the United States increased from 182,884,000 square feet, on a 3/4-inch thickness basis, in 1957 to 494,388,000 square feet in 1963. The increase in the six-year period was 170%, or an annual rate of growth of 15.3%. The rapid growth can be partly explained by the improvements made in product qualities, the lower selling price in recent years, and the tremendous promotional efforts of the industry.

Although the use of particleboard as core material in the furniture and fixtures industries still accounts for over 50% of the market outlets, the entrance of this product into the building field since 1961 has been an important market development for the industry. The use of particleboard as floor underlayment alone reached 122 million square feet in 1963, or about 25% of the total production in that year. This use is expected to increase further both in volume and in percentage.

There are about 56 active particleboard plants in the nation with a total production capacity of over 737,850,000 square feet a year. Of the 56 plants, four are still under construction. The Pacific and South Atlantic are the major producing regions, while Oregon, California, and North Carolina are the leading states. Virginia, Arkansas, and Michigan also are important states in producing particleboard.

There is a vacuum area, comprising Alabama, Florida, Georgia, South Carolina, Tennessee, Mississippi, and Louisiana, without a major particleboard plant. A Georgia-based particleboard plant could operate profitably in this region, with an absolute freight advantage in Alabama, Florida, and Georgia and a relative freight advantage in some portions of South Carolina, Tennessee, and Mississippi over major existing plants. The freight advantage in these states may range from a few dollars to $35 per thousand square feet, depending upon destination and the location of a competing plant in the South.

The market in the absolute freight advantage area is estimated at 22 million square feet in 1963 and 27 million square feet in 1964. The market in the relative freight advantage area is estimated at 27 million square feet in 1963 and 32 million square feet in 1964. A Georgia-based plant could hope to capture a market of about 16 million to 19 million square feet in the six-state region.

A wood particleboard plant producing 17.6 million square feet a year would require about $1,795,500 for fixed investment and $575,000 for working capital. If it is operated three shifts a day, 250 days a year, and at an f.o.b. mill price of $150 per thousand square feet, the cost and profit statement would show $2,640,000 for gross sales, $1,687,084 for total production costs, $606,187 for depreciation and taxes, and $346,729 for net profit, or 14.63% of the total investment. The payout period would be five years.

INTRODUCTION

This study updates a previous study made in 1958 for the purpose of determining the feasibility of producing wood particleboard in Georgia. In the six-year time span between 1958 and 1964, the wood particleboard industry in the United States has undergone great change and growth, both in markets and in the product itself. The change and growth have created an urgent need for re-examination of the manufacturing opportunity offered in the state.

The objectives of the study are as follows:

1. To present up-to-date information on wood particleboard manufacturing and marketing in the United States.
2. To provide an analysis of freight advantage areas and market potentials for Georgia-based wood particleboard plants.
3. To estimate investment costs for efficient-size plants to be operated in Georgia.
4. To estimate production costs and profits for such plants.

This report is presented in two main parts with several sections in each part. The first part describes the growth and change in production, market outlets, standardization, technology, price and competition, and the distribution of plants in the nation. The second part presents the economics of wood particleboard production in Georgia. An analysis of freight, market, and timber resources for two hypothetical Georgia-based plants is given. Detailed estimates on investments, production costs, and returns for these two plants follow.

THE CURRENT STATE OF THE WOOD PARTICLEBOARD INDUSTRY IN THE UNITED STATES

Production and Capacity

Wood particleboard was first produced in the United States during the World War II period, although commercial production of this board actually started after the war. Production was greatly expanded when new glues were discovered and new machines were developed.

Reliable data concerning the production of wood particleboard are not available for the early postwar period; not even the number of manufacturing plants is accurately known. The most authoritative data concerning this industry were first reported in 1957 by the U. S. Bureau of the Census. In that year total production was reported at 182,884,000 square feet, on a 3/4-inch thickness basis, from 46 plants. It increased to 319,282,000 square feet from 49 plants in 1961 and to 494,388,000 square feet from 50 plants in 1963. The production increase amounted to 170% in the six-year period between 1957 and 1963, or an annual compounded rate of growth of 15.3%. The particleboard industry passed through the recessions of 1957-1958 and 1960-1961 without regression or hesitation. This is indeed a young, growing industry.

Judging from the growth record of the wood particleboard industry in the last few years and the current optimistic forecasts about the national economy and construction activities, particleboard production may reach 593 million square feet in 1964, or a 20% gain over 1963. Detailed figures on production, types of board, and number of plants are given in Table 1.

The number of wood particleboard plants appears to be relatively stable from year to year with the exception of the relatively large increase in 1964. These are net figures, however, and do not show the few plants which closed down, changed hands, or were newly erected each year. This young industry, like most manufacturing operations, offers both opportunities and hazards. In Table 1, the 56 plants listed for 1964 include four new plants which are still under construction, but exclude several plants which are not in operation.[1/]

1/ A list of the 56 active wood particleboard plants in the United States is given in Appendix 7, providing information on name, address, personnel, annual capacity, process, and product specifications.

Table 1

U. S. PRODUCTION OF WOOD PARTICLEBOARD
BY TYPES AND NUMBER OF PLANTS, 1957 TO 1964

Year	Production (in 1,000 sq. ft. on 3/4-in. thickness basis) Total	Multi-Platen Board	Extruded Board	Number of Plants
1957	182,884	144,451	38,433	46
1958	225,225	214,356	11,223	n.a.
1959	295,831	255,356	40,475	46
1960	268,362	231,998	36,364	48
1961	319,282	284,351	34,931	49
1962	407,574	366,028	41,546	51
1963	494,388	453,710	40,678	50
1964	593,000*	n.a.	n.a.	56

*Estimated

Source: U. S. Department of Commerce, Bureau of Census, Washington, D. C.

The total annual production capacity of 51 active plants (excluding five unknown) will reach 737,850,000 square feet on a 3/4-inch thickness basis in the United States in 1964. Total manufacturing capacity has increased in recent years, and new plants tend to be more automated in design and larger in scale than older plants. Five active plants with unknown capacity are believed to be small operations with no significant influence on the given total production capacity.

The ratio between production and capacity often is referred to as the indicator of production efficiency. The 494,388,000 square feet produced in 1963 was about 75% of the known production capacity in that year (the total capacity excludes the four new plants under construction and the five plants with unknown capacity). If the 1964 production reaches 593 million square feet as anticipated, it will be about 80% of the current total capacity (including the four new plants but excluding the five unknown).

It is to be noted that the ratio between production and capacity sometimes can be misleading. Besides the new plants under construction, which

contribute no actual production, the plants built in 1962 and 1963 still may not reach their top efficiency because of technical problems, but their capacities are counted in the total. In addition, about 13 captive plants, which are operated mostly on a one-shift basis, account for over 60 million square feet (3/4-inch basis) in annual capacity, while their actual production is less than half of their capacities each year.

There are two basic types of particleboard produced -- multi-platen board and extruded board. Extruded board, generally produced for captive use, has remained almost stable in annual production, while multi-platen board has more than tripled since 1957. Multi-platen board accounted for 92% of wood particleboard produced in 1963.

Applications and Market Outlets

In the early years of production, wood particleboard was designed mainly for the utilization of wood wastes from lumber mills or furniture plants and was used largely as a low-cost substitute for more expensive core materials, such as lumber and plywood. Engineering improvements in the last decade have made wood particleboard a unique commodity in the market in its own right. This board has become a prime product in many fields, for it can be engineered and developed to meet end-use requirements not met by other wood products.

End uses of wood particleboard currently fall into the two main categories of core stock and building board. As core stock in the manufacture of furniture and cabinets, wood particleboard has the desirable properties of dimensional stability, smoothness, ease of application, strength, and machinability. It is used largely as cores for flat surfaces which are overlaid with wood veneer or plastic laminates. Wood particleboard is used in volume in the production of wood case goods furniture (chests of drawers, bedroom bureaus, etc.), cabinets, desks, occasional furniture, kitchen counters, and store fixtures and displays.

As building board in the construction business, wood particleboard is used as underlayment for resilient floor coverings, partitions, floor tile, wall sheathing, and sliding doors. A phenolic-bond board was approved by the FHA as an exterior board a few years ago.

Although the use of wood particleboard as core stock still accounts for over one half of the total production, the use as building board has been

expanding rapidly, especially as floor underlayment, in the last few years. The latter usage rose from 106 million square feet, or 26% of the total output, in 1962 to 122 million square feet, or 25%, in 1963. It is expected to reach 166 million square feet, or 28% of total output, in 1964. A breakthrough in this market has been made since 1961 as a result of the tremendous amount of development work done previously. The tremendous potentials in the building field may be the major gateway to further rapid growth of particleboard manufacturing.

Table 2 shows the distribution of wood particleboard among the various market outlets in the United States, based on a recent private survey.

Table 2

THE MARKET OUTLETS OF WOOD PARTICLEBOARD IN THE UNITED STATES, 1963

Outlet	Per Cent
Furniture	16
Laminators	20
Store fixtures	3
Cabinet shops	16
Builders	13
Prefab and underlayment	16
Panel construction	7
Prefab flooring	5
Exterior and rural	3
Miscellaneous	1
Total	100

Product Specifications and Standardization

In the drive to satisfy the different requirements of various end uses, wood particleboard producers turn out a whole range of products with diverse properties. As a general rule, core stock requires good surface with minimum "show-through" of the surface when overlaid with other materials. It also requires dimensional stability, strength, screw-holding power, and machinability. The requirements of building board give emphasis to internal bond strength, water resistance, and even thickness.

Most commercial wood particleboards are produced in thicknesses ranging from ¼ inch to 1¼ inches, in densities from 35 to 75 pounds per cubic foot, and in panel sizes up to 5 by 20 feet. They can be homogeneous, multi-layered, graduated, fine-surfaced, fiber-surfaced, paper-surfaced, surface-filled, rough-surfaced, sanded, planed, veneer-laminated, plastic-laminated, plastic-coated, printed, and painted.

Three major types of wood particleboard -- splinter, shaving, and flake -- have gained acceptance in the market. Splinter board made from wood residues generally provides the best flatness. Shaving board made from planing mill shavings usually gives the smoothest surface. Flakeboard made with engineered flakes from green wood has the greatest strength. Good-quality boards may be made from any of these three types, but flakeboard has gained over the other two types in the recent years because of its uniform characteristics. In many instances, a mixture of different particles is being used.

In most commercial particleboard plants today, a wood clinic is available for testing the properties of board produced. In some large companies, an independent research department is responsible for the improvement of production or for the developing of new products.

Only five to six years ago, there were complaints about wood particleboard by its users. Misunderstandings were created because the various available products did not have prescribed standards for application and a few poor products appeared on the market. A move was made by a number of wood particleboard producers themselves to set up minimum standards of product properties. This task was taken over by the National Particleboard Association when it was founded in 1960.[1/] The Association has worked closely with the Department of Commerce and FHA in developing industry-wide standards for particleboard.

The Commercial Standard, CS236-61, Mat-Formed Wood Particleboard (Interior Use) was issued on June 1, 1961, as well as the FHA-approved Mat-Formed Wood Particleboard for Floor Underlayment on November 14, 1960. The members of the National Particleboard Association are offering written guarantees for their products, and some of them are stamping their boards with the NPA emblem, signifying compliance with recognized tests and standards. Work is being carried

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1/ The National Particleboard Association currently consists of 18 members and has its headquarters in Washington, D. C.

out to develop additional standards for such uses as core stocks and exterior sheathing.[1/] The West Coast Particleboard Association has also adopted standard specifications for wood particleboard used as floor underlayment and exterior-type panel.[2/]

Technology and Processes

Wood particleboard is an engineered panel made by combining wood flakes, shavings, or splinters with resins and wax and hot pressing them into panels. The properties of a board depend largely upon wood species, type of particles, adhesives, and curing or pressing.

A wide range of wood species, both softwood and hardwood, can be used for making particleboard.[3/] Generally the low-density species are more desirable than high-density species in making medium-density board. Where a greater screw-holding power and smoother surface are required, a mixture of softwood and hardwood is applied. However, the availability of timber in a given area generally dictates the choice of wood used. Good boards have been made from single species of southern pine, spruce, Douglas fir, and others. Good quality board also is made with such hardwood species as poplar, gum, oak, maple, cypress, or willow in a mixture with softwood species.

Wood in nearly any form can be used to prepare a suitable geometric shape for board manufacture. However, the smaller the particle the less suitable it becomes. As mentioned previously, flake, shaving, and splinter are the major types of wood particle used. Sander dust and sawdust generally are used only as surfacing material.

Adhesives used to bond the particles together are usually thermosetting, synthetic resins, such as urea-formaldehyde, phenol-formaldehyde, and melamine-formaldehyde. Urea resin is usually used because of its low cost. Phenol and

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1/ Summaries of the commercial standards for mat-formed wood particleboard for floor underlayment and for interior use are given in Appendices 1 and 2.

2/ Specification for Wood Particleboard Flooring Underlayment, May 18, 1960, and Specification for Exterior-type Wood Particleboard, May 4, 1961, West Coast Particleboard Association, P. O. Box 1265, Roseburg, Oregon.

3/ Timber Engineering Company, What Wood Can You Use in Particleboard? Wood Research No. 34, Washington, D. C., April 1958.

melamine resins cost two to three times more than urea but are necessary for durability in the building and construction market.

Wax, in the form of an aqueous emulsion or a melted petrolatum, is usually added to impart stability to the board. Insecticides, fungicides, and fire retardants can be added if necessary.

There are two basic pressing methods, multi-platen and extrusion. In using the multi-platen press, layers of bonded particles are pressed on a mat to produce a predetermined size of board. In forming extruded board, a single layer of bonded particles is forced through a long, heated die. The continuous length of board which emerges from the die is clipped into panels of the desired length. Extruded board is stronger crosswise than lengthwise, while platen board is almost equally strong in both dimensions.

The newest development in the drying and curing of particleboard is dielectric heating, which permits a substantial reduction in time required to press the board into panels. Consequently, it means the reduction of manufacturing costs. It is also reported that the new process provides the much stronger internal bond strength which is required for building board.

More than a dozen commercial processes are currently available in the United States.[1/] Fourteen better-known processes for wood particleboard, together with their characteristics, are given in Table 3. Some of the processes have been developed in foreign countries but their franchises are distributed in the United States by local firms, while other processes have been developed in this country. There are two extrusion processes (a third one is out of business) which are generally considered better adapted to a captive or small operation utilizing available wood residues from a sawmill or furniture plant. Multi-platen processes constitute over 90% of the current production, with a wide range of choices. The choice of a process depends upon many considerations, such as product quality, end uses, market, wood supply, investment cost, and the reputation of a process. Many independent engineering firms can provide valuable advice.

It is reported that almost all new plants have experienced some mechanical problems in their "shakedown" period. A well coordinated machine selection

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1/ A list of engineering firms and manufacturers or suppliers of equipment for wood particleboard is given in Appendix 6.

Table 3

SUMMARY OF COMMERCIAL PROCESSES FOR WOOD PARTICLEBOARD IN THE UNITED STATES

Process Name	Company	Press	Type of Particle	Panel Size	Thickness	Press Cycle	Board Produced or Specialties
Kreibaum	Dean Co.	Vertical extrusion	Splinter	49" wide	1/2" to 1-7/8"	-	Extruded board
Lanewood	Lane Co.	Horizontal extrusion	Splinter	48" wide	1/2" to 2"	-	Extruded board
Bahre (Bison)	Soderhamm Machine Co.	Multi-platen	Flake or splinter	4' x 16' 5' x 16'	3/8" to 1-1/2"	4 to 6 mins.	Graduated board
Behr	Roddis Timblend	Multi-platen	Flake and shaving	4.3' x 16'	3/8" to 1-3/16"	-	3-layer board
Cardwell	Cardwell Machine Co.	Multi-platen	Splinter	4' x 20'	-	10 mins.	Small operation
Chapman	Chapwood, Inc.	Multi-platen	Shaving and flake	4' x 8'	1/4" to 3/4"	-	Paper-faced with a flake
Columbia Engineering	Columbia Engineering Co.	Multi-platen	Shaving	5' x 16'	1/4" to 1-3/16"	-	Multi-platen board
Emerite Chemical	Kroehler Mfg. Co.	Multi-platen	Shaving	4' x 8' 4' x 12'	1/2" to 1"	4 to 15 mins.	3-layer board
Fahrni (Novo-Ply)	U. S. Plywood Co.	Multi-platen	Splinter and flake	4' x 16' 5' x 16' 6' x 12'	3/8" to 1-3/4"	-	3 layers
Industrial Development	Industrial Development Corp.	Multi-platen	Splinter and flake	5' x 10'	1/4" to 1-1/4"	-	3 layers
Johnson Process	Johnson & Johnson	Multi-platen	Splinter and flake	-	-	4 to 15 mins.	Small operation
Macdonald Associates	Macdonald Associates, Inc.	Multi-platen	All types	5' x 10'	1/4" to 1"	7 to 8 mins.	Homogeneous and sandwich forms
Miller-Hofft	Miller-Hofft, Inc.	Multi-platen	All types	Varied	3/8" to 1-3/16"	-	1 or 3 layers
Wilco Machine Works	Wilco Machine Works, Inc.	Multi-platen	Flake	-	-	-	-

and a good plant layout are essential in assuring a sound operation at the outset of a new plant.

Price and Competition

The price level of wood particleboard in the United States has been declining since 1957. According to a sales executive of a major manufacturer, several widely known brands of flakeboard were selling at $220 per thousand square feet on a 3/4-inch thickness basis in 1957, with little sales resistance. The price was down to $200 in 1958 and to $180 in 1963. In the six-year period between 1957 and 1963, the drop was 18%. The price levels on warehouse, direct mill shipment, and f.o.b. mill from 1957 to 1963 are given in Table 4.

Table 4

APPROXIMATE PRICE MOVEMENT OF FLAKEBOARD IN THE UNITED STATES, 1957, 1958 AND 1963

(Per 1,000 square feet, based on medium-density board, 3/4-inch thickness)

Year	Warehouse	Direct Mill Shipment	F.O.B. Mill
1957	$220	$190	$180
1958	200	170	155
1963	180	150	135

Source: W. R. Purifoy, "Charting Particleboard's Road to Prosperity," Wood and Wood Products, September 1963

The warehouse prices refer to a maximum price charged to end users. The prices for direct mill shipment are for direct deliveries to industrial users or to wholesalers with warehouse facilities. The f.o.b. mill prices are the basic prices for mill production. A sharp price drop was recorded between 1957 and 1958. This might be attributed to the economic recession in 1958. However, the decline also is noticeable from a long-range point of view over the past six years.

The industry generally blames the price decline directly on over-expansion of production capacity. Other factors are also involved. Significant causes are the keen competition in marketing and the low production costs of new

plants. The trend in new plants tends to be toward more automation and larger scale. In the last six to seven years, about a dozen new plants have been built with annual production capacity ranging from 15 million to 60 million square feet each on a 3/4-inch thickness basis. In contrast, plants were built with annual capacity ranging from 5 million to 15 million square feet in the early postwar period.

In addition to production scale, new plants can utilize the latest machine models and the newest production techniques. The result in general is a better product with a lower production cost. A number of older plants, consequently, have been forced out of business. The price level of wood particleboard has gone downward, thus making particleboard a more competitive product in the market. As a result, the market for particleboard has expanded greatly in the last few years.

The competition for markets affects not only price and product, but also customer service. Major producers have taken great pains to provide better service in delivery, sales engineering, and advertising.

According to a number of people in the industry, the wood particleboard market will expand further in the next decade because of two existing conditions. First, due to a shortage of high-grade core materials and high-grade veneer for furniture manufacture, wood particleboard will be used in a greater proportion for making furniture. Second, the improved properties of wood particleboard in terms of internal bonding strength and water resistance will make it a more widely accepted material for building purposes. Wood particleboard already has invaded this important field and the market potentials in the building field are tremendous.

Total imports of particleboard are insignificant at the present time, amounting to approximately 1% of domestic production in 1963, but they have been increasing in recent years. Because of the expanded production capacities and low raw material and labor costs in most foreign countries, domestic producers should watch import trends in the future.

The Distribution of Wood Particleboard Plants

In the immediate postwar period, wood particleboard production was concentrated on the West Coast, where a huge volume of wood residues was available from sawmills and plywood plants. The development of flakeboard by using green

round wood has generated a spread of production on a large scale to the East. Today more new plants are built in the East than in the West. This change is significant in the sense of market requirements and transportation costs.

There are about 56 active wood particleboard plants in the United States, of which 16 are in the Pacific Division, 17 in the South Atlantic, six each in the East North Central and West South Central, five in the East South Central, four in the Middle Atlantic, and one each in the West North Central and the Mountain divisions.[1/] Oregon and North Carolina are the leading states in particleboard production, with 11 plants each, followed by California, Virginia, and Arkansas, with four plants each; Pennsylvania and Michigan, with three each; Texas, Tennessee, and Mississippi, with two each; and New York, Indiana, Illinois, Minnesota, West Virginia, South Carolina, Kentucky, Idaho, and Washington, with one each.

The distribution of annual production capacity is largely consistent with the plant distribution. The West Region, comprising the Pacific and Mountain divisions, accounts for 45.3% of the nation's capacity, while the remaining regions account for 54.7%. The Pacific Division, with 42.3%, leads all divisions, followed by the South Atlantic -- 24.7%, East North Central -- 9.5%, West South Central -- 8.1%, Middle Atlantic -- 6.5%, East South Central -- 4.3%, Mountain -- 3%, and West North Central -- 1.6%.

Oregon, California, North Carolina, and Virginia are the leading states in production capacity. These four states, with a combined capacity of 487,650,000 square feet (on a 3/4-inch thickness basis), account for 66% of the national capacity. Table 5 gives the detailed figures on number of plants, annual capacity, and percentage of the national capacity by division and by state.

The geographical distribution of particleboard plants in the United States is illustrated on Map 1. Individual plants are grouped into three categories according to size -- 1 to 9.9 million square feet, 10 to 24.9 million square

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1/ Geographic groupings are based on the four regions (Northeast, South, North Central, and West) and the nine divisions (New England, Middle Atlantic, West South Central, East South Central, South Atlantic, West North Central, East North Central, Mountain, and Pacific) established by the Bureau of the Census and used in reporting production and plant data in the Census of Manufactures.

Table 5

THE DISTRIBUTION OF THE WOOD PARTICLEBOARD INDUSTRY IN THE U. S. BY PLANT LOCATION, NUMBER OF PLANTS, AND ANNUAL PRODUCTION CAPACITY, 1964

(in 1,000 sq. ft. on 3/4-inch basis)

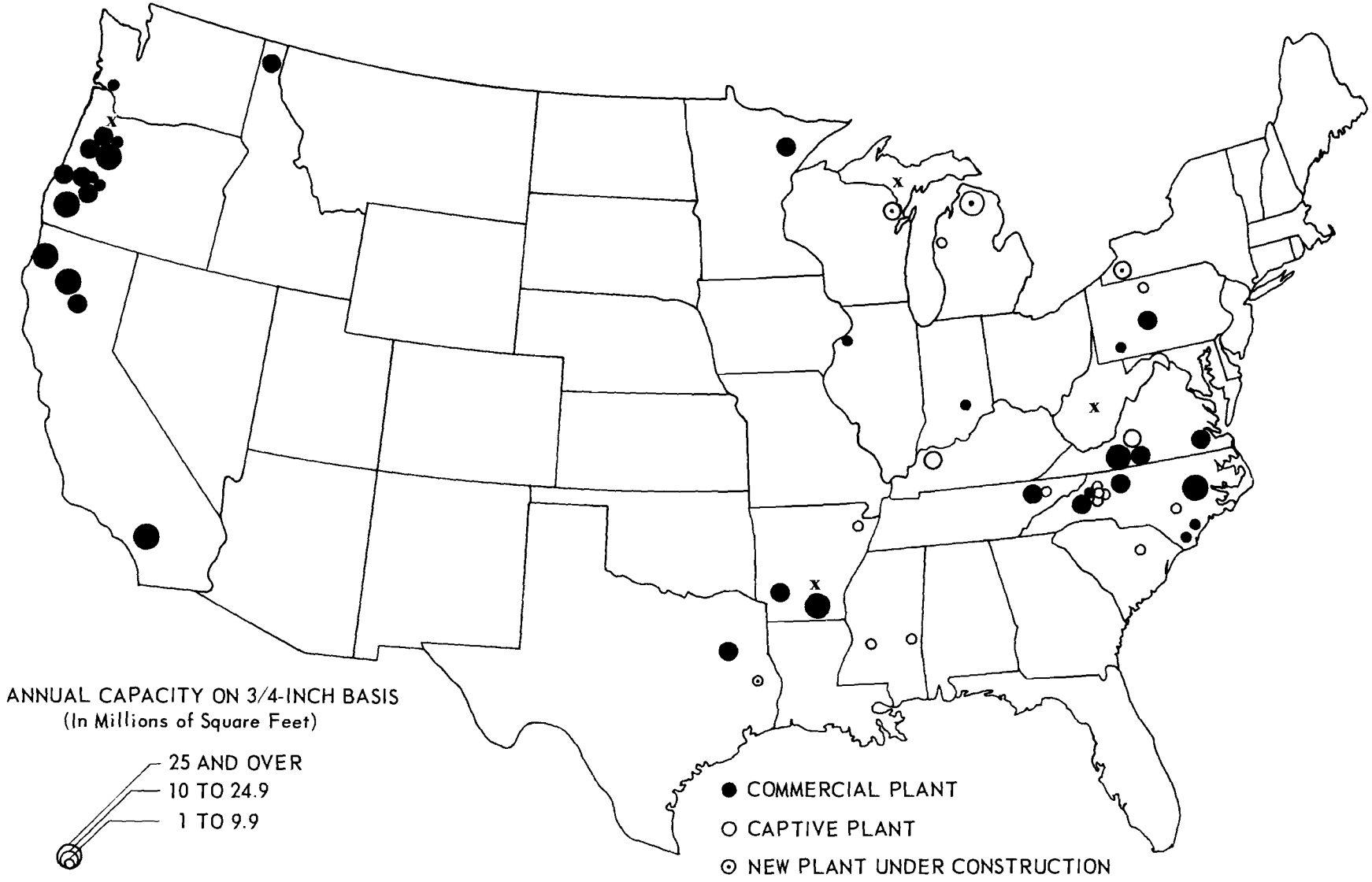
Division and State	Number of Plants	Annual Capacity	Per Cent of Total U. S. Capacity
United States	56	737,850[1/]	100.0
Pacific	16	312,300	42.3
Washington	1	7,000	0.9
Oregon	11*	168,300	22.8
California	4	137,000	18.6
South Atlantic	17	182,350	24.7
Virginia	4	82,000	11.1
West Virginia	1*	-	-
North Carolina	11	100,350	13.6
South Carolina	1*	-	-
East North Central	6	70,000	9.5
Indiana	1	7,000	1.0
Illinois	1	5,000	0.7
Michigan	3*	43,000	5.8
Wisconsin	1	15,000	2.0
West South Central	6	59,600	8.1
Arkansas	4*	45,000	6.1
Texas	2	14,600	2.0
Middle Atlantic	4	48,000	6.5
New York	1	23,000	3.1
Pennsylvania	3	25,000	3.4
East South Central	5	31,600	4.3
Kentucky	1	10,500	1.4
Tennessee	2	11,800	1.6
Mississippi	2	9,300	1.3
Mountain	1	22,000	3.0
Idaho	1	22,000	3.0
West North Central	1	12,000	1.6
Minnesota	1	12,000	1.6

*Annual capacity of one plant in the group is not known.

1/ The total annual production capacity of 51 plants, excluding five plants whose annual capacities are not known.

MAP 1

THE GEOGRAPHICAL DISTRIBUTION OF WOOD PARTICLEBOARD PLANTS IN THE UNITED STATES, 1964



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feet, and 25 million square feet and up. Plants are also classified as commercial, captive, or new plants under construction. Each plant is plotted on the map according to its approximate location, size, and status.

The distribution of wood particleboard plants appears to be either raw material oriented or market oriented, or both. The West Coast, with an excessive production capacity relative to the demand, has to ship its products across the continent in order to reach the eastern markets. Transportation costs run as high as $40 to $50 per thousand square feet (on a 3/4-inch thickness basis). In the East, the major wood particleboard markets are in the states where furniture manufacturers are concentrated -- Virginia, North Carolina, New York, Pennsylvania, and the Great Lakes states. Virginia and North Carolina, with large local furniture manufacturing industries and easy access to markets in the North and the Great Lakes area, have become major particleboard producing centers already. New plants are being built in New York and the Great Lakes states, where the market is sufficient, although timber resources are inadequate for large-scale production. New plants also are being built in Arkansas and eastern Texas, where timber resources are adequate.

Two vacuum areas in the East have no major commercial wood particleboard plants at the present -- the New England Division and the southeastern corner of the South Region. Although New England has limited timber resources and market potentials, it has easy access to the New York-Pennsylvania market. This asset may be somewhat diminished by the existing particleboard production in New York, Pennsylvania, Virginia, and North Carolina.

In contrast, the southeastern corner, which comprises Alabama, Florida, Georgia, South Carolina, Tennessee, Mississippi, and Louisiana, has abundant timber resources and an adequate market for wood particleboard. Although there are two plants in Mississippi and one in South Carolina, they are all captive plants with small production capacity. Tennessee has a captive plant and a medium-sized commercial plant. This large vacuum area of six to seven states without a major commercial particleboard plant offers a number of attractions for such a venture. The advantages of producing wood particleboard in Georgia to serve this area are discussed in terms of timber resources, freight rates, and market potentials in the next section.

It is to be noted that a bagasse board plant has been operated in Vacherie, Louisiana, by the National Bagasse Products Corporation since 1963.[1/] It produces a board with thickness and density ranges comparable with those of wood particleboard. The board is lighter than particleboard and is used in volume as cores of flush doors. It also can be used as plastic or veneer underlayment, but these uses have not been widely accepted at the present. Generally, bagasse board can be used as a substitute for wood particleboard, although it has not yet become a seriously competing item.

It is also reported that Dyna-Tex, Inc., Nashville, Tennessee, has plans to put up a new wood particleboard plant in La Follette, Tennessee. The plans call for an annual capacity of 44 million square feet operating on a three-shift basis to serve the building and furniture industries in the region. A modified Bison System with a dielectric process for curing would be used. The board would be of medium denisty. If this plant materializes, it will have an effect on the supply of wood particleboard in the Southeast. It also indicates the potentials of wood particleboard manufacture in this area.

1/ This plant is not listed as a wood particleboard plant in Appendix 7.

THE ECONOMICS OF WOOD PARTICLEBOARD PRODUCTION IN GEORGIA

Timber and Wood Residue Resources

Wood raw material supply is an important consideration for any wood-based manufacturer. Particleboard manufacture utilizes either wood residues or round wood. Almost all captive particleboard plants in the East use wood residues, although most large commercial plants depend largely on round wood. In the West, however, wood residues are used extensively in many large commercial particleboard plants. The result is a reduction in production cost, thus permitting them to ship their products to the eastern markets.

Shavings are ideal materials for the surface layers of three-layer particleboard, which is one of the best boards on the market. Wood shavings for particleboard should be in dry and clean condition. Other types of wood residues, such as slabs, edgings, and short ends, can be used for splinter-type board, which has gained importance as floor underlayment in recent years. If the volume of wood residues at a given place could meet the wood raw material requirements of a particleboard plant, it would reduce the direct production costs as much as 30%. The advantage over the large plants in the East which use round wood is evident.

Georgia and North Carolina both have large volumes of wood residues available.[1/] It is reported that a huge volume of wood shavings is available in the southern part of Georgia for which there is presently almost no market.

For plants based on round wood, Georgia has excellent resources. Georgia leads the southern states in pulpwood supply, growing stock, and saw timber volume.[2/] Since flakeboard manufacture requires only pulp-size trees, the relative volume of growing stock in the southern states is significant. (See Table 6.) Georgia is foremost in both total volume and the combined volume of softwood and soft hardwood among the 12 southern states. (Soft-textured wood

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1/ Rufus Page and Joseph Saucier, Survey of Wood Residue in Georgia, Resource-Industry Series No. 1, Georgia Forestry Commission, 1958.

Walton Smith and others, Wood Residue in North Carolina -- Raw Material for Industry, Southeastern Forest Experiment Station, Resource-Industry Series No. 8, 1955.

2/ Growing stock refers to sound trees with five-inch diameters and above; saw timber refers to sound trees with nine-inch diameters and above.

is more desirable for particleboard manufacture.) The only state which approaches Georgia's volume is North Carolina, which is the largest wood particleboard producing center in the East.

Table 6

VOLUME OF GROWING STOCK BY SPECIES GROUP
ON COMMERCIAL FOREST LAND IN THE SOUTHERN STATES

(in thousand cords)

State	Year	Softwood	Soft Hardwood	Hard Hardwood	Total
GEORGIA	1961	136,595	43,117	56,162	235,874
North Carolina	1956	105,868	56,769	59,595	222,232
Louisiana	1954	58,474	42,502	114,589	215,565
Alabama	1963	107,600	30,000	59,700	197,300
Virginia	1957	58,205	34,698	81,576	174,479
Arkansas	1959	72,227	18,474	80,245	170,946
South Carolina	1958	61,220	31,592	28,305	121,117
Mississippi	1957	44,177	18,150	45,667	107,994
Texas	1955	53,030	13,523	35,804	102,357
Florida	1959	63,713	15,951	21,040	100,704
Tennessee	1961	17,335	15,851	64,483	97,669
Oklahoma	1956	6,595	867	11,396	18,858

Sources: Forest survey releases, Southeastern Experiment Station and Southern Experiment Station, Forest Service, U. S. Department of Agriculture

A commercial particleboard plant with an annual capacity of 25 million to 30 million square feet on a 3/4-inch thickness basis would require about 30,000 cords of round wood a year. Actually, any southern state can support such a volume of production without much difficulty. The important factors are the distance of the supply source and the costs involved. Since information on the annual growth-cut relationship on the county level is lacking in most of the southern states, the actual wood supply of a specific locality has to be ascertained by direct investigation.

If only the timber supply within a 50-mile radius of a given place is considered, there are numerous cities and towns in Georgia which can qualify for wood particleboard production. However, only three are selected in this study for illustration purposes -- Newnan, Monticello, and Jesup. Two are relatively close to the Atlanta Metropolitan Area and one is in south Georgia. All three are in redevelopment areas as designated by the Area Redevelopment Administration. A summary of timber resources in a 50-mile radius of each of these three Georgia cities is given in Table 7.

Table 7

AVAILABLE TIMBER RESOURCES IN A 50-MILE RADIUS OF THREE GEORGIA LOCATIONS, 1961

Timber Resources	Unit	Newnan	Monticello	Jesup
Area of commercial forest land	1,000 acres	4,126	4,394	4,854
Yellow pine	1,000 cords	18,601	27,392	30,889
Other softwood	1,000 cords	19	227	3,356
Soft hardwood	1,000 cords	7,522	11,552	12,977
All timber	1,000 cords	26,142	39,171	47,222
Estimated annual net yield	1,000 cords	1,831	2,721	3,164
Estimated annual cut	1,000 cords	1,294	1,915	2,697
Available timber	1,000 cords	537	806	467

Sources: Georgia's Timber, Southeastern Forest Experiment Station, U. S. Forest Service, Asheville, North Carolina, 1963

Alabama Forests, Southern Forest Experiment Station, U. S. Forest Service, New Orleans, Louisiana, 1963

Statistics in Table 7 are listed on area of commercial forest land and on volume of yellow pine, other softwood, soft hardwood, and all timber.[1/] The estimated annual net yield and cut are based on the ratio of yield and cut given in the Preliminary Forest Survey Statistics for each forest region in Georgia in 1961. Although Jesup has the largest standing timber volume, its

1/ All timber here refers to the total volume of yellow pine, other softwood, and soft hardwood, but excludes hard hardwood.

available timber is slightly less than in the other two places because heavier cutting for pulpwood is practiced in that region. Monticello has the largest available timber mainly because of the conservation of the national forest area in that region. In any case, a supply of 30,000 cords of soft-textured wood for a particleboard plant of 30 million square feet annual capacity would take only 4% to 6% of the available timber of any of the three Georgia locations.

Freight Advantage Areas

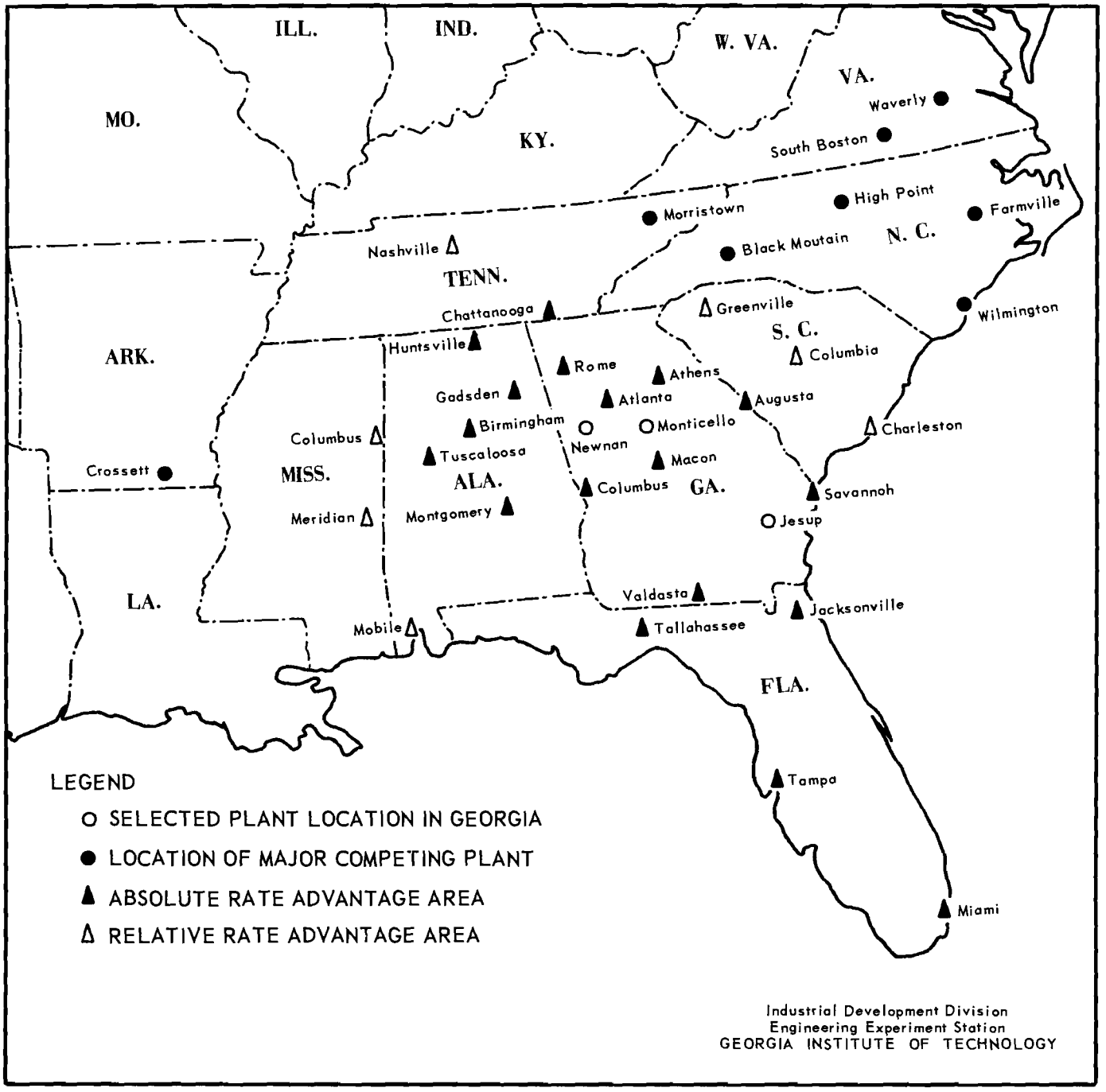
Wood particleboard is shipped either by rail or by truck. In general, railroad transportation is more economical for long-distance shipments, while trucks are more convenient for a short haul. Because of timing flexibility and the saving of reloading costs, truck shipment is more commonly used for distances up to a few hundred miles.

In order to ascertain the areas in which the selected Georgia locations would have a freight advantage over major competing plants in the South, 12 starting points and 33 termination points have been identified. The 12 starting points include three in Georgia, four in North Carolina, two in Virginia, and one each in Tennessee and Arkansas. The 33 termination points are scattered in the Carolinas, Tennessee, Georgia, Alabama, Florida, Mississippi, and Louisiana. Freight rates on both truckload and carload shipments are provided in cents per 100 pounds of wood particleboard from each starting point to each termination point. These detailed rates are given in Appendices 3 and 4.

There are distinct freight advantage areas for the three Georgia locations -- Newnan, Monticello, and Jesup -- over nine out-of-state points where the major competing plants are located. The freight advantage areas for the Georgia plant locations are classified into absolute and relative advantage areas. Absolute advantage refers to at least one or more Georgia plant locations having the lowest rate to a specific termination point. Relative advantage means here that any Georgia starting point is not to be higher in rate than any competing location by 7¢ per 100 pounds for carloads or 16¢ per 100 pounds for truckloads; and it is not to be higher in rate than two competing locations. The truckload freight advantage areas are illustrated on Map 2, and the carload freight advantage areas are presented on Map 3. The absolute and relative freight advantage points are distinguished by the different symbols on the maps.

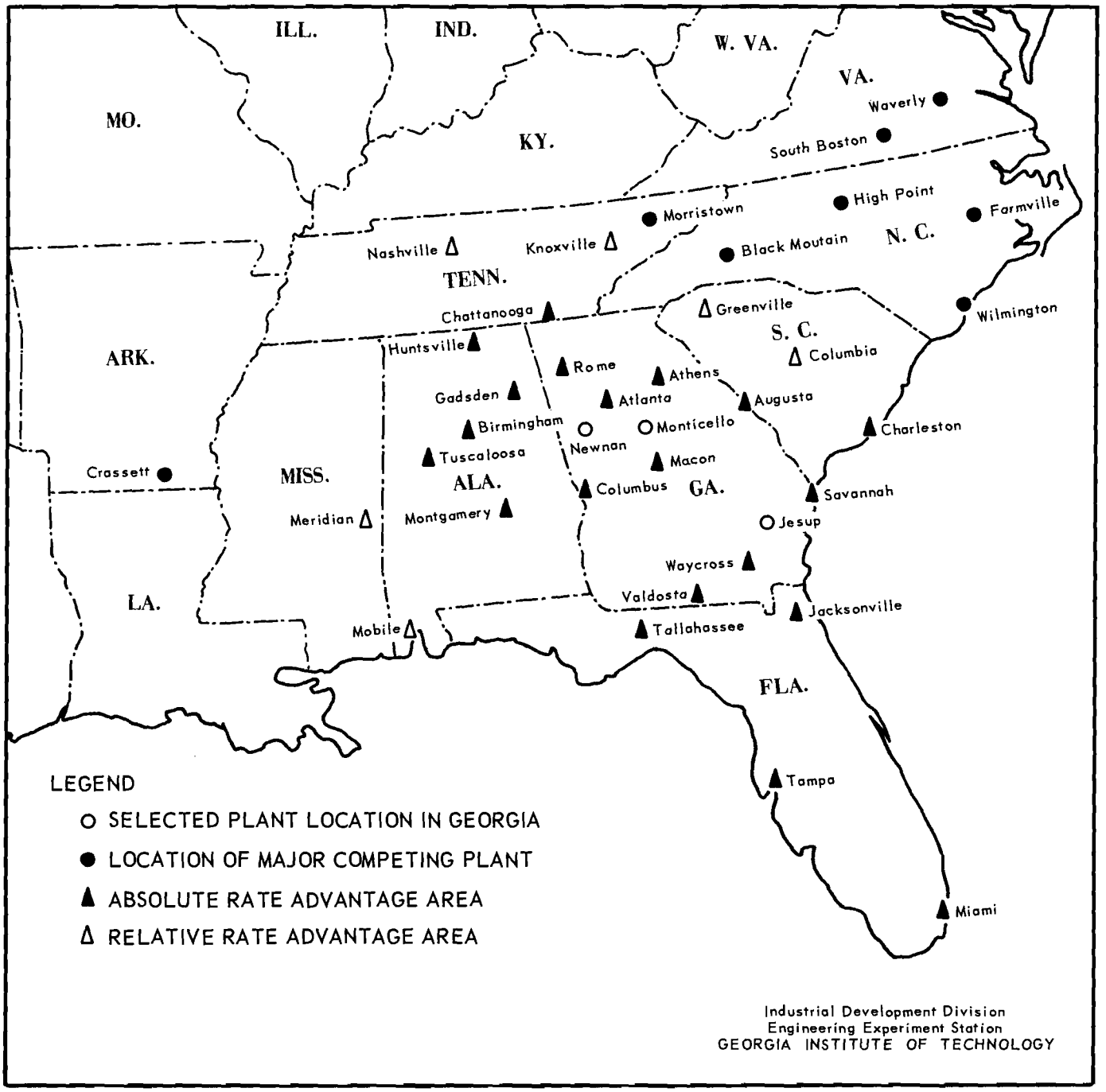
MAP 2

THE TRUCKLOAD FREIGHT ADVANTAGE AREAS OF PROPOSED GEORGIA-BASED WOOD PARTICLEBOARD PLANTS, 1964



MAP 3

THE CARLOAD FREIGHT ADVANTAGE AREAS OF PROPOSED
GEORGIA-BASED WOOD PARTICLEBOARD PLANTS, 1964



The selected plant locations in Georgia have an absolute freight advantage over any existing major wood particleboard manufacturing plant in the states of Georgia, Alabama, and Florida. The relative freight advantage area extends into South Carolina, Tennessee, and Mississippi. Both truck and rail freight advantage areas are similar.

Based on the freight rates given in Appendices 3 and 4, transportation costs per thousand square feet of wood particleboard are given in Table 8 and Table 9. Six starting points and 18 termination points are selected in the tables. Monticello is representative of the other Georgia plant locations. All 18 terminations are in either the absolute or relative freight advantage areas except Knoxville, Tennessee.

It should be noted that all freight data provided here are intended to give only a picture of intraregional competition. As to interregional competition, Georgia's position is about equal to that of North Carolina-Virginia in shipments to the Midwest or the Great Lakes states, but it would not be competitive with the latter group in shipments to the New York-Pennsylvania area. In shipments to the Gulf states and the Southwest, any Georgia plant would face stiff competition from the plants located in Arkansas, Louisiana, and Texas.

A wood particleboard plant in Georgia would have to consider the three-state area of Georgia, Alabama, and Florida as the basic marketing area, plus South Carolina, Tennessee, and Mississippi as the fringe marketing district. However, special product properties, lower price, or vigorous sale efforts could greatly expand the marketing distance far beyond the stated freight advantage areas.

The Southeastern Market

Since the volume of wood particleboard production in the United States is known and the volume of exports and imports is insignificant, the market distribution of particleboard by state can be reasonably estimated by the output indexes of industries which are the prime users of the board in each state. Several indicators which do give output value by state are wood furniture, not upholstered; metal household furniture; household furniture, n.e.c.; and new house starts.

The market distribution of wood particleboard in the six-state area of Alabama, Florida, Georgia, South Carolina, Tennessee, and Mississippi is given

Table 8

TRUCKLOAD RATES PER THOUSAND SQUARE FEET
OF WOOD PARTICLEBOARD,* 1964

	FROM:					
TO:	Monti-cello Ga.	South Boston Va.	Black Mountain N. C.	Farm-ville N. C.	Morris-town Tenn.	Crossett Ark.
Charleston, S. C.	$23.50	$26.00	$25.06	$25.06	$28.82	$56.71
Columbia, S. C.	21.62	24.44	19.74	23.50	23.50	55.14
Greenville, S. C.	20.05	25.06	16.60	26.63	20.36	51.69
Chattanooga, Tenn.	20.99	32.58	23.50	35.72	19.11	38.54
Knoxville, Tenn.	24.44	28.82	18.80	31.96	12.53	47.93
Nashville, Tenn.	27.57	37.91	29.76	40.73	26.00	34.78
Atlanta, Ga.	12.53	30.39	23.50	32.58	22.56	44.17
Augusta, Ga.	15.98	25.06	20.99	26.63	25.06	52.63
Columbus, Ga.	15.98	34.46	28.20	35.09	27.57	36.97
Macon, Ga.	10.97	31.96	26.63	31.96	26.63	46.05
Savannah, Ga.	19.42	28.82	26.00	28.20	28.82	53.26
Valdosta, Ga.	18.48	34.46	30.39	33.84	31.96	48.87
Birmingham, Ala.	22.56	35.72	28.82	37.91	25.06	34.15
Mobile, Ala.	29.76	42.92	36.66	44.17	34.46	30.39
Tuscaloosa, Ala.	25.06	37.91	31.02	39.16	27.57	31.33
Miami, Fla.	37.91	45.74	42.92	45.11	45.11	66.11
Tampa, Fla.	31.02	40.73	37.28	39.16	40.10	57.96
Meridian, Miss.	28.82	41.36	34.46	42.92	31.02	26.94

*Medium density board weighing 3,133 pounds per 1,000 square feet or 47 pounds per cubic foot.

Table 9

CARLOAD RATES PER THOUSAND SQUARE FEET
OF WOOD PARTICLEBOARD,* 1964

TO:	FROM: Monticello Ga.	South Boston Va.	Black Mountain N. C.	Farmville N. C.	Morristown Tenn.	Crossett Ark.
Charleston, S. C.	$ 7.68	$ 9.09	$ 8.46	$ 8.30	$11.12	$28.20
Columbia, S. C.	6.74	7.83	5.95	7.68	7.68	27.88
Greenville, S. C.	6.27	8.30	4.86	9.71	6.42	25.38
Chattanooga, Tenn.	6.58	14.41	7.68	15.51	5.80	20.99
Knoxville, Tenn.	7.83	11.12	5.64	13.78	4.70	24.12
Nashville, Tenn.	10.18	16.29	11.74	17.39	8.77	18.95
Atlanta, Ga.	4.70	12.69	7.68	14.10	7.36	22.24
Augusta, Ga.	5.33	10.03	6.58	9.71	8.30	25.69
Columbus, Ga.	5.80	15.04	10.81	15.35	8.77	20.21
Macon, Ga.	4.70	13.78	9.40	13.47	9.71	22.56
Savannah, Ga.	6.89	11.43	8.77	10.81	11.12	27.26
Valdosta, Ga.	6.74	15.19	12.37	14.72	13.78	24.44
Birmingham, Ala.	7.36	15.66	11.43	16.29	8.46	18.33
Mobile, Ala.	12.06	18.17	15.82	18.64	15.04	16.13
Tuscaloosa, Ala.	8.30	16.29	13.16	16.92	10.18	16.76
Miami, Fla.	16.29	19.27	18.01	18.95	19.11	33.21
Tampa, Fla.	13.00	17.23	16.13	16.92	17.23	29.14
Meridian, Miss.	11.11	17.54	15.04	-	13.00	13.31

*Medium density board weighing 3,133 pounds per 1,000 square feet or 47 pounds per cubic foot.

in Table 10.[1/] The estimates are presented in two groups, according to the freight analysis indicated in the previous section. The first group, which comprises Alabama, Florida, and Georgia, had an estimated market of 22,222,000 square feet on a 3/4-inch basis in 1963 and 26,674,000 square feet in 1964. This group is the basic marketing area for any Georgia-based wood particleboard plant. Both Georgia and Florida have an estimated market of 8 to 10 million square feet a year and Alabama a market of 5 to 6 million square feet a year.

The second group, which comprises South Carolina, Tennessee, and Mississippi, had an estimated market of 26,977,000 square feet in 1963 and 32,151,000 square feet in 1964. Tennessee accounts for more than 50% of the market in this group. A Georgia-based particleboard plant may hope to penetrate a portion of this market.

Table 10

ESTIMATED WOOD PARTICLEBOARD MARKET BY OUTLETS IN THE SIX SOUTHERN STATES, 1963 AND 1964

(in 1,000 sq. ft. on a 3/4-in. thickness basis)

State	1963			1964		
	Total	Furniture and Fixtures	Floor Underlayment	Total	Furniture and Fixtures	Floor Underlayment
Alabama	5,370	4,288	1,082	6,388	4,911	1,477
Florida	8,484	7,718	766	9,885	8,839	1,046
Georgia	8,368	4,661	3,707	10,401	5,338	5,063
Total	22,222	16,667	5,555	26,674	19,088	7,586
South Carolina	6,275	4,586	1,689	7,559	5,252	2,307
Tennessee	14,446	11,335	3,111	17,231	12,981	4,250
Mississippi	6,256	5,369	887	7,361	6,149	1,212
Total	26,977	21,290	5,687	32,151	24,382	7,769

1/ Appendix 5 gives the procedure used in estimating the six-state wood particleboard market.

The table gives estimates on two major particleboard outlets -- furniture and fixtures and floor underlayment. Census data on annual production volume of wood particleboard for floor underlayment provide a convenient index for the estimates. The furniture and fixtures outlet indicated in the table represents all outlets for wood particleboard except floor underlayment. The ratio between furniture and fixtures and floor underlayment is roughly 3 to 2 in each state except Florida and Mississippi, where concrete floors predominate.

Products and Plant Scale

Any Georgia-based wood particleboard plant would have to consider production of both furniture-core-type and floor-underlayment-type or building-type boards. Even though the market for furniture-core-type board still is dominant (about 3 to 2 in comparison with floor-underlayment-type), the market for building-type board is gaining more rapidly than the traditional use of particleboard as core material. In planning future particleboard production in the area, this marketing trend should be considered.

If a new Georgia-based particleboard plant is planned to adapt to the regional needs, the scale of production will have to be consistent with the regional market. Two hypothetical levels of penetration in the six-state market are presented in Table 11. One calls for a 50% penetration in the basic marketing area of Alabama, Florida, and Georgia and a 20% penetration in the fringe area of South Carolina, Tennessee, and Mississippi. Another plan calls for various degrees of market penetration in the six states. The results of the two plans are surprisingly close, each amounting to over 16 million square feet for 1963 and over 19 million square feet for 1964.

In considering the existing regional market based on the freight advantage areas and the future growth of the market in these areas, a Georgia-based wood particleboard plant with 15 million to 25 million square feet annual capacity on a 3/4-inch thickness basis may be adequate to take care of regional needs.

As is well known, the larger a production scale is, the lower the unit cost will be. This also holds true for production costs. The larger a production volume is, the lower will be the production costs per unit. In fact, most of the existing commercial particleboard plants (excluding captive operations) in the United States are over 10 million square feet on a 3/4-inch thickness basis in annual capacity.

Table 11

TWO HYPOTHETICAL LEVELS OF PENETRATION OF THE SIX-STATE MARKET FOR A GEORGIA-BASED WOOD PARTICLEBOARD PLANT, 1963 AND 1964

Level of Market Penetration	1963 Total	1963 Furniture and Fixtures	1963 Floor Underlayment	1964 Total	1964 Furniture and Fixtures	1964 Floor Underlayment
1/2 of A[1/]	11,111	8,333	2,778	13,337	9,544	3,793
1/5 of B[2/]	5,395	4,258	1,137	6,430	4,876	1,554
Total	16,506	12,591	3,915	19,767	14,420	5,347
2/5 Alabama	2,148	1,715	433	2,555	1,964	591
2/3 Florida	5,655	5,145	510	6,589	5,892	697
1/2 Georgia	4,184	2,330	1,854	5,200	2,669	2,531
1/10 South Carolina	627	458	169	756	525	231
1/5 Tennessee	2,889	2,267	622	3,446	2,596	850
1/10 Mississippi	625	537	88	736	615	121
Total	16,128	12,452	3,676	19,282	14,261	5,021

1/ A includes the combined markets in Alabama, Florida, and Georgia.

2/ B includes the combined markets in South Carolina, Tennessee, and Mississippi.

An integrated operation producing wood particleboard in conjunction with southern pine plywood may be an ideal business combination in this region. Since the production of southern pine plywood would generate about two tons of pine core per thousand board feet of logs consumed, an annual production of 50 million square feet of southern pine plywood would create a surplus of 38,562 tons of pine core, which would be large enough to support a wood particleboard plant with an annual capacity of 19 million to 20 million square feet on a 3/4-inch thickness basis. Since southern pine plywood manufacture is a new and growing industry in the South,[1/] a potential producer of pine

1/ Tze I. Chiang, The Feasibility of Producing Southern Pine Plywood in Georgia, Industrial Development Division, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Georgia, October 1963.

plywood might well give thought to wood particleboard production as a part of an integrated enterprise.

Possible Investment Costs and Returns

Two sets of costs and returns for wood particleboard production are given in this section. Basic data on investment and production were obtained from two leading engineering companies for wood particleboard plants in the United States. Detailed returns were worked out, based on the given data. It should be noted that all figures provided in this section are intended merely to give a broad indication of likely costs and profits for a plant under certain given conditions. Although there is no assurance that a plant could be built and operated for the specific costs given, the estimates are considered to be reasonable and should be regarded as guides.

The first plant is based on a Miller-Hofft process with annual production of 17 million square feet on a 3/4-inch thickness basis and a three-shift operation for 250 days a year. Fixed investments, including building, machinery, and miscellaneous, come to $1,795,500, and working capital is estimated at $575,000. Based on an f.o.b. mill price of $150 per thousand square feet, gross sales would be $2,640,000, total production costs $1,687,084, depreciation and taxes $606,187, and net return $346,729, or 14.63% of the total investment. A break-even chart provided in Figure 1 indicates that an annual production level of 7.6 million square feet is the break-even point for covering the total costs, and an annual production level of 5.4 million square feet is the break-even point for covering the out-of-pocket costs.

The second plant is based on a Macdonald Associates process with annual production of 24.3 million square feet on a 3/4-inch thickness basis and a three-shift operation for 300 days a year. Fixed investments, including building, machinery, and auxiliaries, come to $1,972,450, and working capital is estimated at $760,800. Based on an f.o.b. mill price of $150 per thousand square feet, gross sales would be $3,645,000, total production costs $2,035,007, depreciation and taxes $967,506, and net return $642,487, or 23.51% of the total investment. An annual production level of 8.1 million square feet is the break-even point for covering total costs, and 6.1 million square feet is the break-even point for covering out-of-pocket costs. (See Figure 2.)

F.o.b. mill prices of $140 and $145 per thousand square feet are also provided in the estimates of costs and returns for the above two plants. The current delivered prices of flakeboard in Atlanta range from $180 to $220 per thousand square feet on a 3/4-inch thickness basis. An f.o.b. mill-price range from $145 to $155 is reported for the major competing plants in Arkansas, North Carolina, and Virginia.

The detailed production conditions, estimated costs and returns, summary statements, and break-even charts for the two model plants mentioned are given separately in the following tables and figures in this section.

PLANT NO. 1

Miller-Hofft Process
5' x 10' x 16 openings
17,600,000 square feet per year, 3/4-inch basis
Based on 22 productive hours per day and 250 working days a year

A. Estimated Fixed Investment

1. Building		
Manufacturing area 12,000 sq. ft.		
Warehousing area 20,000 sq. ft.		
32,000 sq. ft. @ $6.00/sq. ft.		$ 192,000
Foundation and shedding		10,000
Site preparation		7,500
		209,500
2. Miller-Hofft Fully Automatic System		
Engineering, supervision of erection and initial operation		1,050,000
3. Auxiliary equipment, including fork lift trucks; bulk storage for glue, wax, and oil; heating and ventilating equipment; automatic finishing equipment; miscellaneous saws and packaging equipment; and laboratory facilities		368,000
4. Miscellaneous		
Freight, erection, and contingencies		168,000
Total Fixed Investment		$1,795,500

B. Operational Conditions

1. Wood raw material: Southern yellow pine pulpwood logs, assumed to weigh 55 lbs./cu. ft. at 50% moisture content, wet basis, and at approximately 84 cu. ft. of solid wood per cord, or about 4,600 lbs. per cord.

2. Resin and wax: Resin treatment based on the use of urea-formaldehyde mix at 65% solid content. Treatment at the rate of 7% resin solids based on the oven dry weight of wood. Wax emulsion treatment based on the use of wax emulsion mix at 45% solid content. Treatment at the rate of 1% wax solids based on the oven dry weight of wood.

3. Production: Based on 3/4-inch sanded board produced at the rate of 4 cycles per hour, or 3,200 sq. ft. per hour.

4. Labor requirement for the plant is estimated as follows:

Area	Classification	No. Men Per Job	Man Hours Per Day	Rate
Yard	Unloading Lift Operator	1	24	1
Yard	Log Handlers	2	48	1
Yard	Debarker Operator	1	24	1
Yard	Saw Operator	1	24	1
Preparation Area	Flaker Operators	3	72	2
Preparation Area	Dryer Operator	1	24	2
Press Room	Former Operator	1	24	2
Press Room	Press Operator	1	24	2
Press Room	Utility Operator	1	24	2
Press Room	Fork Lift Operator	1	24	1
Finishing Dept.	Fork Lift Operator	1	24	1
Finishing Dept.	Saws and Sanders	3	72	2
Warehouse	Warehousing and Carloading	4	32	1
General	Shift Foreman	1	24	3
General	Maintenance-Sharpener	1	24	2

Total Man Hours/Day - Rate 1 = 200 Hours - Unskilled Labor.
Total Man Hours/Day - Rate 2 = 264 Hours - Semi-skilled Labor.
Total Man Hours/Day - Rate 3 = 24 Hours - Supervision.

Man Hours/M Sq. Ft. - Rate 1 = 2.84 Man Hours/M Sq. Ft.
Man Hours/M Sq. Ft. - Rate 2 = 3.75 Man Hours/M Sq. Ft.
Man Hours/M Sq. Ft. - Rate 3 = .34 Man Hours/M Sq. Ft.

C. Estimated Production Costs
(Per 1,000 (M) sq. ft. on a 3/4-inch thickness basis)

1. Raw Material Costs

Wood costs = 1.38 cords/M sq. ft. @ $15.00/cord
= 1.38 x 15.00 = $20.70/M sq. ft.

Resin costs = 270# UF @ 65% solids/M sq. ft. @ $0.085/1b.
= 270 x .085 = $22.95/M sq. ft.

Catalyst costs = 16.2# catalyst/M sq. ft. @ $0.10/1b.
= 16.2 x .10 = $1.62/M sq. ft.

Wax emulsion = 55.6# wax emulsion @ 45% solids/M sq. ft. @ $0.10/1b.
= 55.6 x .10 = $5.56/M sq. ft.

Total Raw Material Costs = $50.83/M sq. ft.

2. Utility Costs

Fuel oil, dryer = 37.1 gal./M sq. ft. @ $0.11/gal.
= 37.1 x .11 = $4.08/M sq. ft.

Power = 250 kwh/M sq. ft. @ $0.015/kwh
= 250 x .015 = $3.75/M sq. ft.

Steam = 1,750#/M sq. ft. @ $0.50/1,000 lbs.
= 1.75 x .50 = $0.88/M sq. ft.

Total Utility Costs $8.71/M sq. ft.

3. Direct Labor Costs

Rate 1 = unskilled labor $1.25/hour

Rate 2 = semi-skilled labor $1.74/hour

Rate 3 = supervision $2.50/hour

Rate 1 = 2.84 man hrs./M sq. ft. x $1.25 = $3.55/M sq. ft.

Rate 2 = 3.75 man hrs./M sq. ft. x $1.75 = $6.57/M sq. ft.

Rate 3 = .34 man hrs./M sq. ft. x $2.50 = $0.85/M sq. ft.

Total Direct Labor Cost $10.97/M sq. ft.

4. Other Fixed Costs

Depreciation -- building at 20 years and equipment at 10 years

Maintenance and supplies -- at 3% of fixed investment

Property taxes -- at 1% of fixed investment

Insurance -- at 1% of fixed investment

Selling expense -- at 5% of gross sales

General administration -- at 5% of manufacturing costs

Interest rate -- at 6% of total investment

D. Estimated Working Capital

1.	One month's glue supply	$ 44,000
2.	Three months' wood supply	91,000
3.	One month's finished goods	220,000
4.	One month's invoices payable	220,000
	Total	$575,000

Table 12

ESTIMATED COSTS AND RETURNS OF WOOD PARTICLEBOARD PLANT NO. 1

(Based on annual production of 17.6 million sq. ft. on a 3/4-in. thickness basis and on a 3-shift operation, 250 days a year)

		Mill Sale Price (f.o.b. mill/1,000 square feet):		
		$140.00	$145.00	$150.00
Gross Sales		$2,464,000	$2,552,000	$2,640,000
Variable Costs	Per 1,000 sq. ft.			
Raw Materials	$50.83	$ 894,608	$ 894,608	$ 894,608
Utilities	8.71	153,296	153,296	153,296
Direct Labor	10.97	193,072	193,072	193,072
Total	$70.51	$1,240,976	$1,240,976	$1,240,976
Variable Profit		$1,223,024	$1,311,024	$1,399,024
Fixed Costs				
Out-of-Pocket Fixed Costs:				
Maintenance and Supplies		$ 53,865	$ 53,865	$ 53,865
Property Taxes		17,955	17,955	17,955
Insurance		17,955	17,955	17,955
Interest		142,230	142,230	142,230
Selling Expense		123,200	127,600	132,000
General Administration		82,103	82,103	82,103
Total		$ 437,308	$ 441,708	$ 446,108
Cash Income		$ 785,716	$ 869,316	$ 952,916
Non-Fund Fixed Cost:				
Depreciation		$ 169,075	$ 169,075	$ 169,075
Net Income before Taxes		$ 616,641	$ 700,241	$ 783,841

Table 13

SUMMARY STATEMENT OF ESTIMATED COSTS AND RETURNS
OF WOOD PARTICLEBOARD PLANT NO. 1

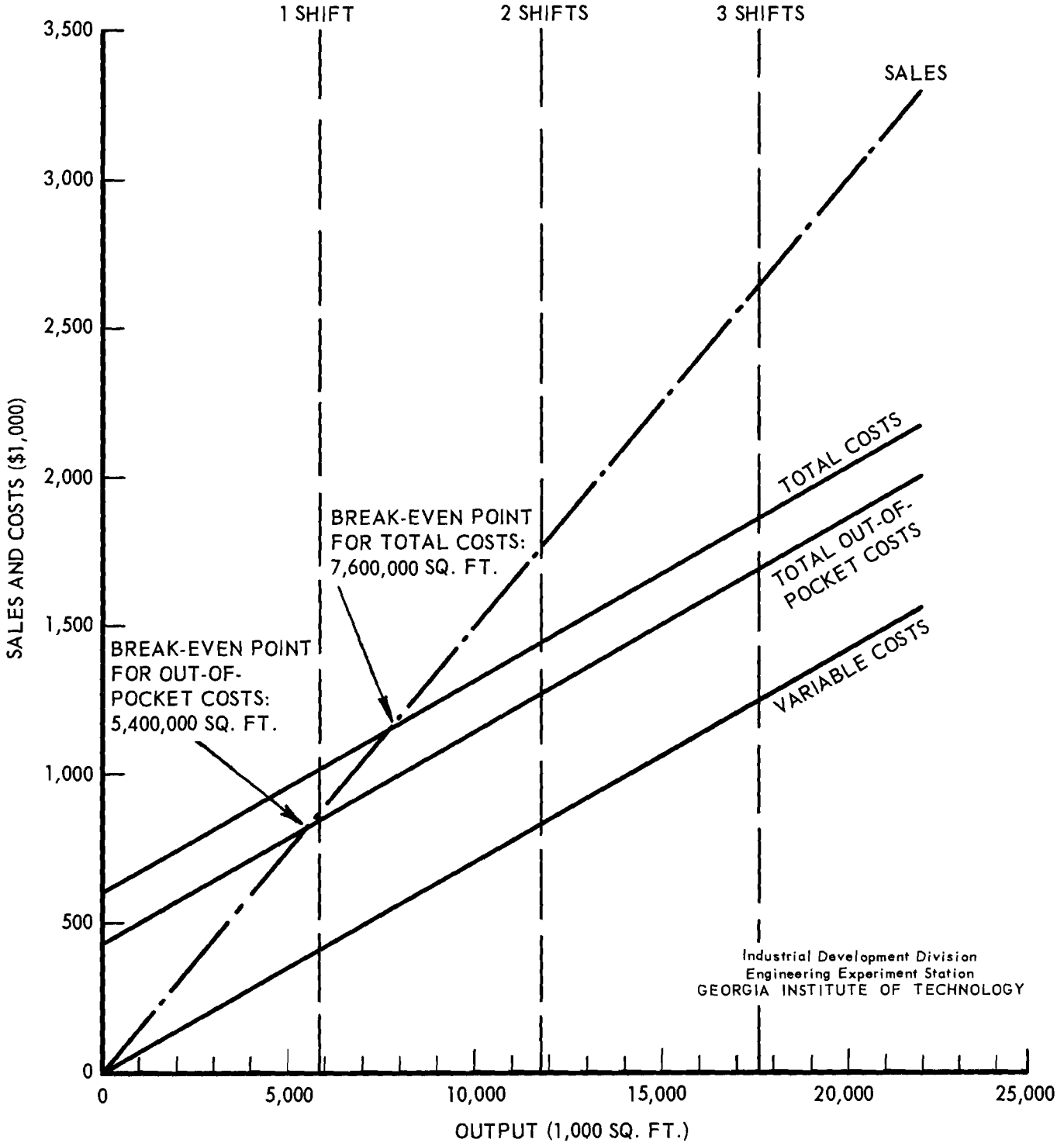
(Based on annual production of 17.6 million sq. ft. on a 3/4-in. thickness basis and on a 3-shift operation, 250 days a year)

	Mill Sale Price (f.o.b. mill/1,000 square feet):		
	$140.00	$145.00	$150.00
Income			
Gross Sales	$2,464,000	$2,552,000	$2,640,000
Variable Costs	1,240,976	1,240,976	1,240,976
Variable Profit	$1,223,024	$1,311,024	$1,399,024
Out-of-Pocket Fixed Costs	437,308	441,708	446,108
Cash Income	$ 785,716	$ 869,316	$ 952,916
Depreciation	169,075	169,075	169,075
Net Income before Taxes	$ 616,641	$ 700,241	$ 783,841
Taxes, Federal (50%)[1/]	308,320	350,120	397,920
State (5%)[1/]	30,832	35,012	39,192
Net Income after Taxes	$ 277,489	$ 315,109	$ 346,729
Investment			
Fixed Investment	$1,795,500	$1,795,500	$1,795,500
Working Capital	575,000	575,000	575,000
Total	$2,370,500	$2,370,500	$2,370,500
Per Cent Return on			
Fixed Investment	15.45	17.54	19.31
Total Investment	11.71	13.29	14.63
Payout Period (with depreciation included)	6.5 years	5.7 years	5.2 years

1/ Based on the new corporation taxes for 1964.

FIGURE 1

BREAK-EVEN CHART FOR WOOD PARTICLEBOARD PLANT NO. 1
(Based on annual production of 17.6 million sq. ft. on a 3/4 in. thickness basis, at a selling price of $150 per 1,000 sq. ft.)



PLANT NO. 2

Macdonald Associates Process
5' x 10' x 12 openings
24,300,000 square feet per year, 3/4-inch basis
Based on 22.5 productive hours per day and 300 working days a year

A. Estimated Fixed Investment

1. Building

Manufacturing and warehousing area 160' x 260' = 41,600 sq. ft. @ $5.00/sq.ft.	$ 208,000
Wood preparation building 50' x 120' = 9,000 sq. ft. @ $5.00/sq. ft.	45,000
Sheds for barker and chip storage 12,600 sq. ft. @ $2.00/sq. ft.	25,200
Foundation	12,500
Site preparation	9,300
	$ 300,000

2. Macdonald Automatic System

All equipment, freight, erection and initial operation	$1,252,450

3. Auxiliary Equipment, including fork lift trucks; storage for glue, wax and oil; heating and ventilating equipment; miscellaneous saws and packaging equipment; and laboratory facilities — 420,000

Total Fixed Investment	$1,972,450

B. Operational Conditions

1. Product -- 40 pounds per cubic foot, trimmed and sanded, 3-layer and homogeneous flakeboard
2. Press cycle -- minimum 9 minutes
3. Wood raw material -- cordwood or other solid wood material, about 85 cords of green wood per day (2,739 pounds of dry wood per cord) for optimum operation
4. Labor -- 42 man days per 24 hours

C. Estimated Production Costs
(Per 1,000 sq. ft. on a 3/4-inch thickness basis)

1. Raw Material Costs

Wood costs = 1.19 cords/M sq. ft. @ $15.00/cord
= 1.19 x 15.00 = $17.85/M sq. ft.

Resin costs = 183# UF @ 6% to 10% content/M sq. ft. @ $0.125/lb.
= 183 x .125 = $22.87/M sq. ft.

Wax emulsion = 15.3#/M sq. ft. @ $0.09/lb.
= 15.3 x .09 = $1.38/M sq. ft.

Catalyst costs = 16.2#/M sq. ft. @ $0.10/lb.
= 16.2 x .10 = $1.62/M sq. ft.

Total Raw Material Costs = $43.72/M sq. ft.

2. Utility Costs

Fuel and oil = 25.3 gal./M sq. ft. at $0.095/gal.
= 25.3 x .095 = $2.40/M sq. ft.

Power = 250 kwh/M sq. ft. @ $0.02/kwh
= 250 x .02 = $5.00/M sq. ft.

Steam = 1,750#/M sq. ft. @ $0.50/1,000 lbs.
= $0.88/M sq. ft.

Total Utility Costs = $8.28/M sq. ft.

3. Direct Labor Costs

336 man hours per day or 4.2 man hours/M sq. ft. @ $2.25/hour

4.2 x 2.25 = $9.45/M sq. ft.

4. Other Fixed Costs

Depreciation -- building at 20 years and equipment at 10 years

Maintenance and supplies -- at 3% of fixed investment

Property taxes -- at 1% of fixed investment

Insurance -- at 1% of fixed investment

Selling expense -- at 5% of gross sales

Administration -- at 5% of manufacturing costs

Interest rate -- at 6% of total investment

D. Estimated Working Capital

1.	One month's glue supply	$ 52,400
2.	Three months' wood supply	108,400
3.	One month's finished goods	300,000
4.	One month's invoices payable	300,000
	Total	$760,800

Table 14

ESTIMATED COSTS AND RETURNS OF WOOD PARTICLEBOARD PLANT NO. 2

(Based on annual production of 24.3 million sq. ft. on a 3/4-in. thickness basis and on a 3-shift operation, 300 days a year)

		Mill Sale Price (f.o.b. mill/1,000 square feet):		
		$140.00	$145.00	$150.00
Gross Sales		$3,402,000	$3,523,500	$3,645,000
Variable Costs	Per 1,000 sq. ft.			
Raw Materials	$43.72	$1,062,396	$1,062,396	$1,062,396
Utilities	8.28	201,204	201,204	201,204
Direct Labor	9.45	229,635	229,635	229,635
Total	$61.45	$1,493,235	$1,493,235	$1,493,235
Variable Profit		$1,908,765	$2,030,265	$2,151,765
Fixed Costs				
Out-of-Pocket Fixed Costs:				
Maintenance		$ 59,174	$ 59,174	$ 59,174
Property Taxes		19,724	19,724	19,724
Insurance		19,724	19,724	19,724
Interest		163,995	163,993	163,995
Selling Expense		170,100	176,175	182,250
Administration		96,905	96,905	96,905
Total		$ 529,622	$ 535,697	$ 541,772
Cash Income		$1,379,143	$1,494,568	$1,609,993
Non-Fund Fixed Cost:				
Depreciation		$ 182,245	$ 182,245	$ 182,245
Net Income before Taxes		$1,196,898	$1,312,323	$1,427,748

Table 15

SUMMARY STATEMENT OF ESTIMATED COSTS AND RETURNS
OF WOOD PARTICLEBOARD PLANT NO. 2

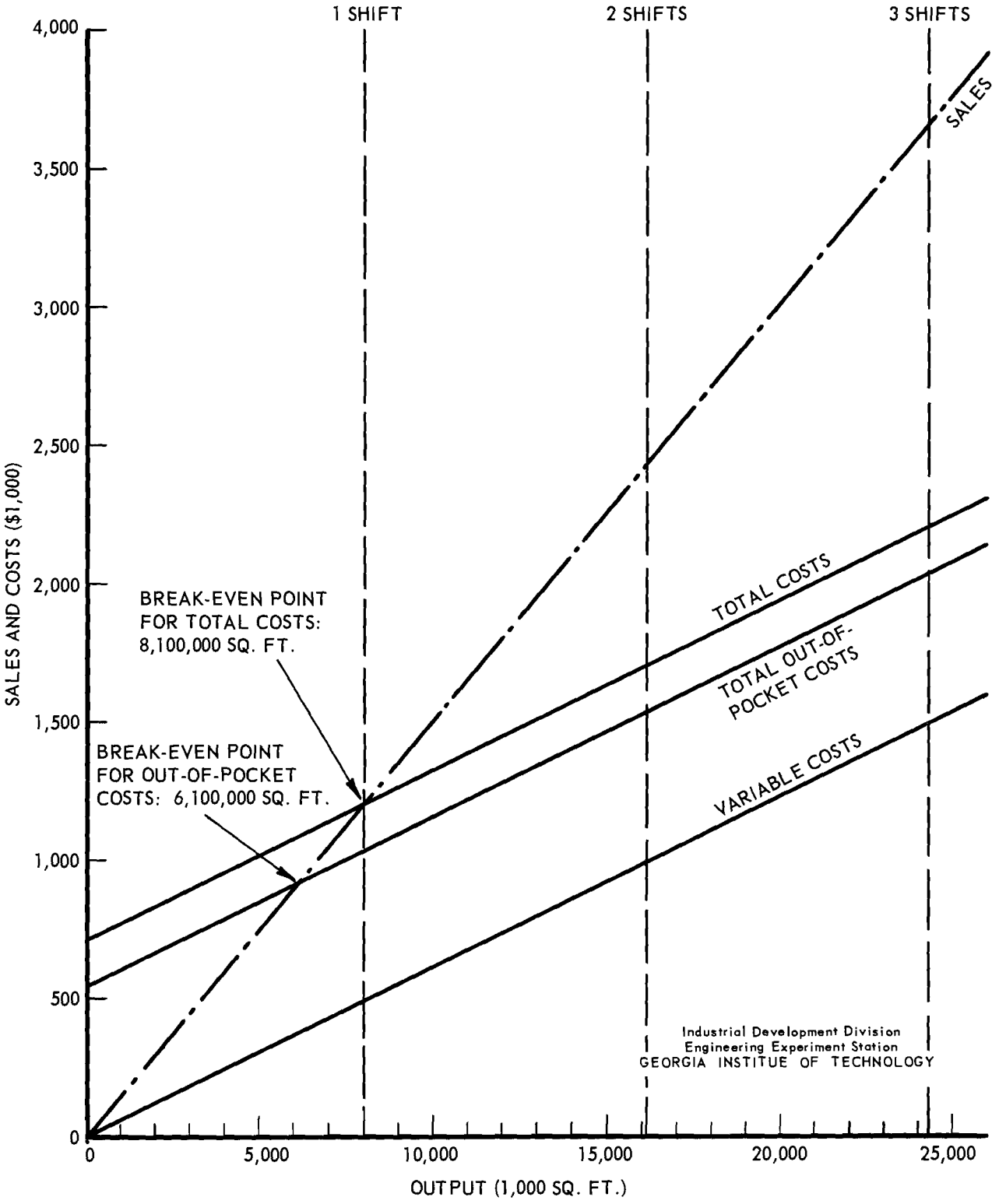
(Based on annual production of 24.3 million sq. ft. on a 3/4-in. thickness basis and on a 3-shift operation, 300 days a year)

	Mill Sale Price (f.o.b. mill/1,000 square feet):		
	$140.00	$145.00	$150.00
Income			
Gross Sales	$3,402,000	$3,523,000	$3,645,000
Variable Costs	1,493,235	1,493,235	1,493,235
Variable Profit	$1,908,765	$2,032,265	$2,151,765
Out-of-Pocket Fixed Costs	529,622	535,697	541,772
Cash Income	$1,379,143	$1,494,568	$1,609,993
Depreciation	182,245	182,245	182,245
Net Income before Taxes	$1,196,898	$1,312,323	$1,427,748
Taxes, Federal (50%)[1/]	598,449	656,161	713,874
State (5%)[1/]	59,845	65,616	71,387
Net Income after Taxes	$ 538,604	$ 590,546	$ 642,487
Investment			
Fixed Investment	$1,972,450	$1,972,450	$1,972,450
Working Capital	760,800	760,800	760,800
Total	$2,733,250	$2,733,250	$2,733,250
Per Cent Return on			
Fixed Investment	27.31	29.94	35.57
Total Investment	19.71	21.61	23.51
Payout Period (with depreciation included)	3.7 years	3.3 years	3.1 years

1/ Based on the new corporation taxes for 1964.

FIGURE 2

BREAK-EVEN CHART FOR WOOD PARTICLEBOARD PLANT NO. 2
(Based on annual production of 24.3 million sq. ft. on a 3/4 in. thickness basis, at a selling price of $150 per 1,000 sq. ft.)



APPENDICES

Appendix 1

SPECIFICATIONS DEFINING PHYSICAL PROPERTY REQUIREMENTS
OF MAT-FORMED WOOD PARTICLEBOARD FOR INTERIOR USE

Property	Value	Tolerance	Test Method
Thickness, inches	1/8 - 1-3/8	1/16 - 1/8	ASTM D-1037-56T
Size, feet	4 ft. by 8 ft. or larger	--	ASTM D-1037-56T
Moisture content % (as shipped from mill)	5 - 10%		ASTM D-1037-60T
Density	Stated by the manufacturer	+ 10% - 5%	ASTM D-1037 Section 86
Modulus of rupture lbs./sq. in. (flexural strength)	1450 - 1600 psi	--	ASTM D-1037 Section 10-19
Modulus of elasticity lbs./sq. in.	200,000 - 250,000 psi	--	ASTM D-1037 Section 10-19
Internal bond lbs./sq. in.	50 - 60 psi	--	ASTM D-1037 Section 27-31
Dimensional stability linear expansion %	0.50%	--	ASTM D-1037 Section 76-79
Screw holding (face) minimum lbs.	200 lbs.	--	ASTM D-1037 Section 88-94
Screw holding (edge) minimum lbs.	130 lbs.	--	

Source: Mat-Formed Wood Particleboard (Interior Use), Commerical Standard CS236-61, U. S. Department of Commerce, Washington, D. C.

Appendix 2

SPECIFICATIONS DEFINING PHYSICAL PROPERTY REQUIREMENTS
OF MAT-FORMED WOOD PARTICLEBOARD FOR FLOOR UNDERLAYMENT

Property	Value	Tolerance	Test Method[1]
Thickness, inches	1/4 in. to 3/4 in.	± 0.010 in.	ASTM D-1037-56T Sec. 7
Size, feet	2 ft. by 4 ft. 4 ft. by 4 ft. 4 ft. by 8 ft.	+ 0.00 in. - 1/8 in.	ASTM D-1037-56T Sec. 6
Moisture content % (as shipped from mill)	7% avg.	± 2	ASTM D-1037-56T Sec. 8, 86, 87(a)
Density[2]	40 min. avg.	No single test value less than 38	ASTM D-1037-56T Sec. 8, 86, 87(b)
Modulus of rupture lbs./sq. in. (flexural strength)	1,600 psi min. avg.	No single test value less than 1,450 psi	ASTM D-1037-56T Sec. 10-19 (excepting Sec. 12)
Modulus of elasticity lbs./sq. in.	250,000 psi min. avg.	No single test value less than 200,000 psi	ASTM D-1037-56T Sec. 10-19 (excepting Sec. 12)
Internal bond lbs./sq. in. tension strength (perpendicular to surface)	70 psi min. avg.	No single test value less than 60 psi	ASTM D-1037-56T Sec. 27-32
Hardness, pounds	500 lbs. min. avg.	No single test value less than 450 lbs.	ASTM D-1037-56T Sec. 53-58
Dimensional stability[3] linear expansion (%)	0.35% max. avg.	--	ASTM D-1037-56T Sec. 76-79
Water absorption[4] weight increase (%)		--	ASTM D-1037-56T Sec. 69-75
2 hours	6% max. avg.		
24 hours	15% max. avg.		
Swelling-thickness increase (%)			
2 hours	5% max. avg.	--	
24 hours	10% max. avg.		
Squareness[5]	1/8 in. max.	--	
Straightness[6]	1/16 in. max.	--	

1/ Five individual specimens required for all tests.

2/ Board density based on volume and moisture content at time of shipment.

3/ Specimen shall be conditioned at 50% and at 90% relative humidity. Conditioning shall continue at each humidity until practical equilibrium is reached.

4/ Specimen shall be submerged in accordance with the alternate method -- horizontally under 1 in. of water.

5/ Squareness shall be determined by measuring the deviation between the two diagonal measurements of trimmed panels.

6/ Straightness is determined by measuring the maximum deviation from a straight line extending from corner to corner on the same trimmed edge.

Source: Mat-Formed Wood Particleboard for Floor Underlayment, Use of Materials Bulletin No. UM-28, November 14, 1960, Federal Housing Administration, Washington, D. C.

Appendix 3

TRUCKLOAD RATES IN CENTS PER HUNDRED POUNDS FOR WOOD PARTICLEBOARD SHIPMENTS IN THE UNITED STATES, 1964
(Medium density board weighing 47 pounds per cubic foot)

	FROM:											
TO:	Monti-cello Ga.	Newnan Ga.	Jesup Ga.	South Boston Va.	Waverly Va.	Black Mountain N. C.	High Point N. C.	Farm-ville N. C.	Wilmington N. C.	Morris-town Tenn.	Crossett Ark.	Eugene Ore.
Asheville, N. C.	78	80	88	78	90	33	50	67	65	50	170	511
Charlotte, N. C.	75	83	83	64	78	42	37	56	54	71	179	558
Greensboro, N. C.	88	92	92	47	65	51	33	50	51	78	191	558
Wilmington, N. C.	92	102	88	70	71	65	53	42	33	95	200	558
** Charleston, S. C.	75	88	61	83	90	80	75	80	67	92	181	558
** Columbia, S. C.	69	78	67	78	85	63	65	75	67	75	176	558
Florence, S. C.	78	88	75	70	78	75	61	65	53	85	188	558
** Greenville, S. C.	64	67	80	80	92	53	65	85	80	65	165	558
* Chattanooga, Tenn.	67	63	90	104	112	75	95	114	110	61	123	487
Knoxville, Tenn.	78	72	97	92	99	60	83	102	99	40	153	511
Memphis, Tenn.	104	95	119	139	146	112	130	146	141	102	78	465
** Nashville, Tenn.	88	83	105	121	128	95	112	130	128	83	111	487
* Atlanta, Ga.	40	35	66	97	108	75	85	104	97	72	141	511
* Athens, Ga.	38	46	63	90	102	70	78	95	88	83	153	511
* Augusta, Ga.	51	60	55	80	97	67	75	85	78	80	168	511
* Columbus, Ga.	51	41	63	110	121	90	99	112	104	88	118	511
* Macon, Ga.	35	45	54	102	110	85	92	102	92	85	147	511
* Rome, Ga.	52	43	75	105	117	80	95	110	104	67	128	511
* Savannah, Ga.	62	70	39	92	102	83	85	90	80	92	170	558
* Valdosta, Ga.	59	64	46	110	117	97	102	108	99	102	156	511
* Birmingham, Ala.	72	61	90	114	128	92	104	121	114	80	109	487
* Gadsden, Ala.	65	54	88	110	121	88	99	114	108	75	116	487
* Huntsville, Ala.	80	70	99	114	123	88	105	123	121	75	109	487
** Mobile, Ala.	95	83	102	137	146	117	125	141	134	110	97	487
* Montgomery, Ala.	72	58	80	117	128	97	105	121	114	92	109	487
* Tuscaloosa, Ala.	80	69	95	121	132	99	110	125	121	88	100	487
* Jacksonville, Fla.	80	85	51	108	114	99	102	105	97	108	170	558
* Miami, Fla.	121	123	99	146	150	137	139	144	134	144	211	558
* Tallahassee, Fla.	78	75	65	119	125	104	110	117	108	105	150	558
* Tampa, Fla.	99	102	80	130	137	119	121	125	117	128	185	558
Jackson, Miss.	104	92	110	141	150	121	132	146	141	110	69	465
** Meridian, Miss.	92	80	99	132	144	110	121	137	130	99	86	487
New Orleans, La.	110	99	117	148	159	132	141	152	148	121	95	465

* Absolute freight advantage area: At least one or more Georgia starting points have the lowest rate to a specific termination.

** Relative freight advantage area: (1) Any Georgia starting point is not to be higher in rate than any competing location by 16¢ per 100 lbs. or $5 per 1,000 square feet, and

(2) Any Georgia starting point is not to be higher in rate than two competing locations.

Appendix 4

CARLOAD RATES IN CENTS PER HUNDRED POUNDS FOR WOOD PARTICLEBOARD SHIPMENTS IN THE UNITED STATES, 1964
(Medium density board weighing 47 pounds per cubic foot)

	FROM:											
TO:	Monti-cello Ga.	Newnan Ga.	Jesup Ga.	South Boston Va.	Waverly Va.	Black Mountain N. C.	High Point N. C.	Farm-ville N. C.	Wilmington N. C.	Morris-town Tenn.	Crossett Ark.	Swiss-home Ore.
Asheville, N. C.	25	26½	32½	25	34½	15	20	32	30	15	87	230
Charlotte, N. C.	24½	28	28	20	26	17	15	23	20½	23	90	240
Greensboro, N. C.	32	36½	36½	15	20½	20	15	18½	20	26	95	240
Wilmington, N. C.	35½	43	32	22	23	29	21	17½	15	38½	99	240
* Charleston, S. C	24½	32	18½	29	33½	27	24½	26½	21	35½	90	240
** Columbia, S. C.	21½	26	21	25	31	19	20½	24½	21	24½	89	240
Florence, S. C.	26	32½	24	22	25	24	18½	20½	15½	31	94	240
** Greenville, S. C.	20	21	27	26½	35½	15½	20½	31	27	20½	81	240
* Chattanooga, Tenn.	21	19	33½	46	49	24½	38½	49½	48½	18½	67	211
** Knoxville, Tenn.	25	23½	39½	35½	42	18	28	44	42	15	77	230
Memphis, Tenn.	45	37½	51	58½	61	49	55	62	59½	43	39½	188
** Nashville, Tenn.	32½	29	47	52	55	37½	49	55½	55	28	60½	211
* Atlanta, Ga.	15	15	23½	40½	47½	24½	31	45	39½	23½	71	230
* Athens, Ga.	15	16	24	34½	44	22	26	38½	32½	28	77	230
* Augusta, Ga.	17	21½	20	32	39½	21	24½	31	25	26½	82	230
* Columbus, Ga.	18½	15	22	48	52	34½	42	49	46	28	64½	230
* Macon, Ga.	15	15	18	44	48	30	35½	43	36½	31	72	230
* Rome, Ga.	17½	15	28	46½	50½	27	37½	48	45	21	68	230
* Savannah, Ga.	22	25	15	36½	43	28	30	34½	26½	35½	87	240
* Valdosta, Ga.	21½	23½	15	48½	51	39½	44	47	41½	44	78	230
* Birmingham, Ala.	23½	18½	34½	50	54½	36½	46	52	49½	27	58½	211
* Gadsden, Ala.	20½	16	32½	48½	52½	32	42	50	47½	24	64½	211
* Huntsville, Ala.	26½	22	42	50	53	32½	46½	53	52	24½	58½	211
** Mobile, Ala.	38½	29	43	58	61½	50½	53½	59½	57	48	51½	211
* Montgomery, Ala.	23½	17½	27	50½	55	39½	47	52½	49½	35½	58½	211
* Tuscaloosa, Ala.	26½	21½	37½	52	56½	42	48½	54	52	32½	53½	211
* Jacksonville, Fla.	27	30	15	47½	50	41½	43	46½	39½	47	87	240
* Miami, Fla.	52	53	41½	61½	64	57½	59	60½	57	61	106	240
* Tallahassee, Fla.	25	24	20½	51½	54	46	48½	51	47	47	76	240
* Tampa, Fla.	41½	44	26½	55	57½	51½	52½	54	51	55	93	240
Jackson, Miss.	45	35½	48	60	64	52	56	58	59½	48	33½	194
** Meridian, Miss.	35½	27	42	56	60½	48	52½	-	55½	41½	42½	211
New Orleans, La.	48½	42	50½	63	67	56	59	65	62½	52	49½	188

* Absolute freight advantage area: At least one or more Georgia starting points have the lowest rate to a specific termination.

** Relative freight advantage area: (1) Any Georgia starting point is not to be higher in rate than any competing location by 7¢ per 100 lbs. or $2 per 1,000 square feet, and

(2) Any Georgia starting point is not to be higher in rate than two competing locations.

Appendix 5

THE PROCEDURE USED IN ESTIMATING THE WOOD PARTICLEBOARD MARKET IN SIX SOUTHERN STATES, 1963 AND 1964

I. Calculated each state's percentage of the combined value added by manufacture of wood furniture, not upholstered (SIC 2511), metal household furniture (SIC 2514), and household furniture, n.e.c. (SIC 2519) in the United States. SIC 2511 + SIC 2514 + SIC 2519 = SIC 251 - (SIC 2512 + SIC 2515).

	Value Added by Manufacture, 1958 (in thousands of dollars)				
State	251 Household Furniture	2512 Wood Furniture, Upholstered	2515 Mattresses and Bed Springs	2511 + 2514 + 2519 Wood Furniture, not Upholstered; Metal Household Furniture; Household Furniture, n.e.c.	
Alabama	13,797	1,741	1,285*	10,771	1.15%
Florida	31,195	4,574	7,160	19,461	2.07
Georgia	33,811	8,353	13,730	11,728	1.25
South Carolina	12,992	391	1,028	11,572	1.23
Tennessee	56,244	19,223	8,488	28,533	3.04
Mississippi	26,946	12,758	690*	13,498	1.44
UNITED STATES	1,579,626	391,243	248,801	939,582	100.00

*Estimated, data not available

Source: U. S. Bureau of the Census, U. S. Census of Manufactures, 1958

II. Calculated each state's percentage of the number of houses with basement or crawl space in the United States.

State	Total Private Nonfarm Housing Starts, 1962	Per Cent of Single-Family Houses with Basement or Crawl Space, 1962	Number of Houses with Basement or Crawl Space, 1962	Per Cent of the United States
Alabama	23,300	30	6,990	0.89
Florida	70,200	7	4,914	0.63
Georgia	39,800	60	23,880	3.05
South Carolina	14,700	74	10,878	1.39
Tennessee	22,100	53	11,713	2.56
Mississippi	19,200	30	5,760	0.73
UNITED STATES	1,450,900	54	783,486	100.00

Sources: National Association of Home Builders and Forest Products Marketing Branch, Division of Forest Economics, U. S. Department of Agriculture

III. The national production of wood particleboard is given:

	1963 (In sq. ft. on 3/4-inch basis)	1964* (In sq. ft. on 3/4-inch basis)
U. S. total production	494,388,000	593,000,000
Furniture and fixtures	372,860,000	427,000,000
Floor underlayment	121,528,000	166,000,000

*Estimated

IV. Multiplied the state percentages in Section I and Section II by the given national production for furniture and fixtures and floor underlayment in Section III.

ESTIMATED WOOD PARTICLEBOARD MARKET BY OUTLETS
IN THE SIX SOUTHERN STATES, 1963 AND 1964
(In 1,000 square feet on 3/4-inch thickness basis)

State	1963 Total	1963 Furniture and Fixtures	1963 Floor Underlayment	1964 Total	1964 Furniture and Fixtures	1964 Floor Underlayment
Alabama	5,370	4,288	1,082	6,388	4,911	1,477
Florida	8,484	7,718	766	9,885	8,839	1,046
Georgia	8,368	4,661	3,707	10,401	5,338	5,063
South Carolina	6,275	4,586	1,689	7,559	5,252	2,307
Tennessee	14,446	11,335	3,111	17,231	12,981	4,250
Mississippi	6,256	5,369	887	7,361	6,149	1,212
UNITED STATES	494,388	372,860	121,528	593,000	427,000	166,000

Appendix 6

A PARTIAL LIST OF ENGINEERING FIRMS AND MANUFACTURERS OR SUPPLIERS OF EQUIPMENT FOR WOOD PARTICLEBOARD IN THE UNITED STATES

Albert Switzer Associates, 3150 Valley St., Baton Rouge, Louisiana

The Cardwell Machine Company, P. O. Box 1359, Richmond 11, Virginia

Chapwood, Inc., Corvallis, Oregon

Columbia Engineering Company, 209 Cress Bldg., Corvallis, Oregon

The Dean Company, 666 Lake Shore Drive, Chicago 11, Illinois

Industrial Development Corporation, 3011 South Chandler St., Tacoma, Washington

Johnson and Johnson, Engineers and Architects, 111 W. Washington St., Chicago, Illinois

The Kroehler Manufacturing Company, Meridian, Mississippi

The Lane Company, Inc., Altavista, Virginia

Macdonald Associates, Inc., 19/20 Hout Building, Corvallis, Oregon

Miller-Hofft Company, P. O. Box 8718, Richmond 26, Virginia

Rust Engineering Company, 930 Fort Duquesne Boulevard, Pittsburgh, Pennsylvania

Soderhamm Machine Manufacturing Company, Talladega, Alabama

Washington Iron Works, 1500 Sixth Ave., S., Seattle 4, Washington

Wilco Machine Works, P. O. Box 30145, Metropolitan Airport, Memphis, Tennessee

APPENDIX 7

A LIST OF ACTIVE WOOD PARTICLEBOARD PLANTS IN THE U. S., 1964

Listings with (*) are from last available information. New data not furnished.

AMERICAN FURNITURE CO. INC.
Home Address: Starling Ave., Martinsville, Va.
Plant Address: Hairston St., Martinsville, Va.
Personnel: R. M. Simmons, Jr., pres.; R. L. Whitener, vice-pres. & sls. mgr.; Moyer Hall, supt.; J. L. Minter, tech. dir. & plant engr.
Production: (Rated Annual Capacity) 10,000,000 sq. ft. 13/16" basis.
1962 Production: 7,170,265 sq. ft.
Rated Daily Capacity: 45 tons
Process: Lane Wood Extruder
Panel Sizes: Cut-to-size
Percent Into Cut-Up Sizes: 100%
Thicknesses: 13/16, 15/16, 17/17, 19/16 inches.
Raw Material Used: Wood chips
Volume (mill residues): 11,700 tons annually
Spec. Gravity: .65
Colors: Natural
Trade Name: Particle Board.
Uses: Core stock
Percent af Praduct for Own Use: 33%
Speciolty Items: Core stock, furniture stock, underlayment, cut-to-size.

AMERICAN PARBOARD DIV.
American Liberty Oil
Home Address: Box 8105, Dallas, Texas.
Plant Address: Black Mountain, North Carolina
Personnel: T. L. Wynne, pres.; K. N. Stordalen, gen. mgr.; Jack Brown, supt.; Mr. Sobol, sales mgr.; Bob Maxwell, plant engr.
Production: (Rated Annual Capacity) 12,000,000 sq. ft. ¾" bosis.
1962 Production: 9,000,000 sq. ft.
Rated Daily Capacity: 60 tons
Process: Platen
Panel Sizes: 4' x 8'
Percent Into Cut-up Sizes: 70%
Thicknesses: ⅜" to 1-3/16"
Raw Material Used: Eastern White Pine, Appalachian hardwoods.
Volume (mill residuesl: 50 Tons; (from logs) 50 Tons.
Trade Names: Parboard, Parflake
Uses: Furniture, solid core doors, partitions, church & school furniture.
Percent of Product for Own Use:
Specialty Items: Core stock, furniture stock, cut-to-size, cabinet stock.
Sales Agents: L-M Forest, R. E. Laube.

THE BERKLINE CORP.
Home Address: P.O. Box 100, Morristown, Tenn.
Plant Address: Trade St., Marristown, Tenn.
Personnel: Jacob Popkin, pres.; Howard Westhaver, mgr.; Clifford Rice, supt.; Mel Margolin, sls. mgr.; Don Cady, tech. dir.; Frank Magill, plant engr.
Production: (Rated Annual Capacity) 1,800,000 sq. ft. 9/16" basis.
1962 Production: 800,000 sq. ft.
Rated Daily Capacity: 90 tons
Process: Horizontal Extrusion
Panel Sizes: 45" width—variable lengths
Percent Into Cut-Up Sizes: 100%
Thicknesses: 9/16"
Raw Material Used: Oak chips (fines)
Volume (mill residues): 1450 tons annually
Spec. Gravity: .80
Colors: Natural
Uses: Veneered furniture parts
Percent of Product for Own Use: 50%
Specialty Items: Core stock, furniture stock, veneer overlay.

BIG BEAR BOARD PRODUCTS INC.
Home Address: Box 128, Redlands, Calif.
Plant Address: same
Personnel: David H. Rogers, pres.; Donald E. Lengel, mgr.; Earl Hammond, supt.; James Robinson, sales mgr.; Cecil S. Carter, plant engr.
Production: (Rated Annual Capacity) 52,000,000 sq. ft. ⅜" basis.
1962 Production: 4,500,000 sq. ft. began production in Sept. 1962)
Rated Daily Capacity: 120 tons
Process: Columbia Engineering Particle Board
Panel Sizes: 4 x 8 feet
Percent Into Cut-up Sizes: 10%
Thicknesses: ¼" to 1-3/16"
Raw Material Used: Pine and white fir
Volume (mill residues): 35,000 tons annually
Spec. Gravity: .5 to 1.1
Trade Names: Econacore, Edgetite, Premium, Formula
Uses: Floor underlayment, furniture core, specialty applications.
Characteristics: Smaoth hard surface, tight edge.
Specialty Items: Core stock, furniture stock, underlayment, cut-to-size, cabinet stock, construction, high density boards.
Sales Agents: U. S. Plywood, Georgia-Pacific Corp., and Independents.

BROWNSVILLE PARTICLE BOARD AND ASSOCIATED PRODUCTS, INC.
Home Address: Brownsville, Oregon
Plant Address: Brownsville, Oregon
Personnel: Francis E. Hoffman, vice president, gen. & sales mgr.; Richard S. Davis, supt.; John Laufman, tech. dir.
Production (Rated Annual Capacity): 21,000,000 sq. ft. ¾" basis
1962 Production: 15,700,000 sq. ft.
Rated Daily Capacity: 72 tons
Process: Dry—Multi-Platen
Panel Sizes: 48"x96"; 50"x98"
Percent Into Cut-Up Sizes: none
Thicknesses: ¼ to 1¼ inches
Raw Materials Used: Douglas Fir planer shavings.
Volume (mill residues): 17,280 tons annually
Spec. Gravity: .067
Trade Name: Neopar.
Uses: Core, underlayment, exterior siding, ceiling tile, wall board, fire proof board, termite board.
Characteristics: Homogeneous
Percent of Product for Own Use: None
Specialty Items: Core, furniture stock, underlayment, cabinet stock, sheathing, veneer overlay, paper or plastic overlay, floor tile, construction, decking, decorative, V-groove, shadow wall exterior, shadaw line random vee, shadow tile, ceiling tile
Sales Agents: World Wide Woods, Evergreen Products, E. T. Gunn & San.

CAROLINA FOREST PRODUCTS INC.
Home Address: Box 1251, Wilmington, N. C.
Plant Address: King St., Wilmington, N. C.
Personnel: John Colucci, Jr., pres. & sls. mgr.; George E. Kidder, mgr.; Don McCallum, supt.
Production: (Rated Annual Capacity) 9,000,000 sq. ft. ¾" basis.
1962 Production: 7,500,000 sq. ft.
Process: Miller-Hofft
Panel Sizes: 5'x8'
Percent Into Cut-Up Sizes: 90%
Thicknesses: ⅜" ta 1⅛"
Raw Material Used: Pine planer shavings
Volume (mill residues): 100%
Spec. Gravity: Air Dry Density; Dina-Shav 51#; Shav-Bond 47#.
Trade Names: Dina-Shav and Shav-Bond
Uses: Furniture and dinette trade, tile underlayment.
Percent of Product for Own Use: none
Specialty Items: Core stock, underloyment, cut-to-size, furniture stock.
Sales Agents: Carolina Pacific Sales, Inc., Wilmington, N. C.

CASCADE FIBER COMPANY
Home Address: 50 N. Danebo Ave., Eugene, Ore.
Plant Address: Eugene, Ore.
Personnel: L. L. Stewart, pres.; Vance W. Vollmer, gen. & sales mgr.; George D. Mohr, supt.; Paul R. Walsh, tech. dir.
Production: (Rated Annual Capacity) 22,000,000 sq. ft. ¾" basis.
1962 Production: 4,000,000 sq. ft. (began production October 1962)
Rated Daily Capacity: 150 tons
Process: Cascade Fiber Process
Panel Sizes: Up to 54" x 192"
Percent Inta Cut-Up Sizes: As needed.
Thicknesses: ¼"-1¼"
Raw Material Used: Douglas fir planer shavings and chips
Volume (mill residues): 25,000 tons annually
Spec. Gravity: 0.55-0.80
Colors: Natural
Trade Names: Firlak, Fircraft
Uses: Construction and industrial applications
Characteristics: Fine surfaced, low & high density constructions.
Percent of Product for Own Use: none
Specialty Items: Core stock, furniture stock, underlayment, cut-to-size, cabinet stock, veneer overlay, prefill, siding.

CLEAR FIR PRODUCTS OF OREGON LTD.
Home Address: Box 189, Springfield, Oregon
Plant Address: Springfield, Ore.
Personnel: Foster Anderson, mgr.; Ben Andrews, supt.; Frank S. Clarke, sls. mgr.
Production: (Rated Annual Capacity) 10,000,000 sq. ft. ¼" basis.
1962 Production: 4,000,000 sq. ft.
Rated Daily Capacity: 28 tons
Process: Dry—Own
Panel Sizes: 4'x8' only
Percent Into Cut-Up Sizes: None
Thicknesses: ¼" only
Raw Material Used: Trim
Volume (mill residues); 6,000 tons annually
Spec. Gravity: .95
Colors: Light tan or veneer color.
Trade Names: Cleartex (Sand-Drift, Classic, Pleatwood)
Uses: Wall panel, underlayment, utility hardboard applications.
Characteristics: S-2-S, Phenolic bonded, Rigid, impact resistant.
Percent of Product for Own Use: none
Specialty Items: Veneer overlay, construction, decorative, prefinish, underlayment.
Sales Agents: Clear Fir Sales Co., Springfield, Ore.

COLLINS PINE COMPANY
Home Address: Terminal Sales Bldg., Portland, Oregon
Plant Address: Chester, Calif.
Personnel: Truman W. Collins, pres.; Elmer R. Goudy, mgr.; Alan C. Goudy, Flakeboard Div. mgr.; P. W. Foote, sls. mgr.; R. R. Grahlman, Asst. sls. mgr., Flakeboard Div.; Harry Demaray, tech. dir.; Everett Maxey, plant engr.

Production (Rated Annual Capacity): 24,000,000 sq. ft. 3/4" basis
Rated Daily Capacity: 120 tons
Panel Sizes: 4'x8' and 5'x10'
Thicknesses: 3/8 to 1 1/4 inches
Raw Materials Used: Pine and fir
Colors: Natural
Trade Name: Collins Flakeboard
Uses: Furniture, core stock, cabinet stock, underlayment, etc.
Percent of Product for Own Use: None
Specialty Items: Core stock, furniture stock, underlayment, cut-to-size, cabinet stock.

DIXIE CHIPBOARD CO.
Home Address: 427 W. Randolph, Chicago, Ill.
Plant Address: P.O. Box 156, Rural Hall, N. C.
Personnel: T. J. Connelly, pres.; D. E. Schmidt, gen. & sls. mgr. & tech dir.; Hubert Butcher, supt.; G. H. Wilson, plant engr.
Production: (Rated Annual Capacity) 10,000,000 sq. ft. 3/4" basis.
1962 Production: 2,705,000 sq. ft.
Rated Daily Capacity: 50 tons
Process: Kreibaum Vertical Extrusion
Panel Sizes: Any size required
Percent Into Cut-Up Sizes: 95%
Thicknesses: 1/2" to 2"
Raw Material Used: Pine shavings
Volume (mill residue): 4,056 tons annually
Spec. Gravity: .74
Uses: Carestock
Characteristics: Exceptionally stable dimensionally in thickness
Percent of Product for Own Use: none
Specialty Items: Core stock, furniture stock, cut-to-size, lumber edge banding, non-load bearing partitions, cores.
Sales Agents: The Dean Co., Chicago, Ill.

DURAFLAKE COMPANY
Home Address: 326 Pacific Bldg., Portland, Ore.
Plant Address: P. O. Box 245, Albany, Ore.
Personnel: William Swindells, Sr., pres.; Irvin Wentworth, mgr.; Thomas Moore, supt.; W. W. Affolter, vice-pres. sales; George Swindells, sls. mgr.; Warren E. Saltz and Lestor Barton, sales engineers; Y. C. Cheo, tech. dir.
Production: (Rated Annual Capacity) 36,000,000 sq. ft. 3/4" basis.
1962 Production: 32,000,000 sq. ft.
Rated Daily Capacity: 140 tons
Process: Multiple-Platen Bison System
Panel Sizes: 60 1/2x194 inches max.
Percent Into Cut-Up Sizes: 70%
Thicknesses, 3/8, 1/2, 5/8, 11/16, 3/4, 1, 1 1/8, 1-3/16 inches
Row Material Used: Douglas fir & West Coast Hemlock wood shavings
Volume (mill residues): 50,000 tons annually
Spec. Gravity: 0.64-0.80
Colors: Natural
Trade Names: Duraflake
Uses: Furniture core, floor underlayment, cabinets, table tennis tops, doors, counters, sink tops, store fixtures.
Characteristics: Fine smooth surface, excellent screw holding, dimensional stability, high internal bond.
Percent of Product for Own Use: None
Specialty Items: Core stock, furniture stock, underlayment, cut-to-size, veneer overlay, cabinet stock, prefill, construction.

FLAKEBORD CORPORATION
Home Address: Box 1119, Jamestown, New York
Plant Address: same
Personnel: Walter G. McIntosh, pres.; T. A. Thompson, Works mgr.; Robert Brooks, supt.; Stuart L. Crawford, Industrial sales mgr.; Gunter Bucking, tech. dir.; Harry Shea, plant engr.
Production: (Rated Annual Capacity) 23,000,000 sq. ft. 3/4" basis.
Rated Daily Capacity: 80 tons
Process: Bison System Platen Press.
Thicknesses: 3/8 to 1-3/16 inches.
Raw Material Used: Whole green wood
Volume (from logs): 17,500 tons annually
Spec. Gravity: 42 lb.
Uses: Core material for veneering and high pressure laminates.
Characteristics: Graduated layer type flakeboard.
Percent of Products for Own Use: None
Specialty Items: Core stock, furniture stock, cut-to-size
Sales Agents: Simpson Timber Co.

FORMICA CORP.
Home Address: 4614 Spring Grove Ave., Cincinnati, Ohia
Plant Address: P. O. Box 229, Farmville, N. C.
Personnel: W. A. Smith, pres. & gen. mgr.; C. G. Reiter, mgr.; T. J. Canning, plant mgr.; A. J. Lesbirel, sls. mgr.; A. J. Heeb, tech. dir.; J. A. Schinner, plant engr.
Production: (Rated Annual Capacity) 40,000,000 sq. ft. 3/4" basis.
1962 Production: 22,000,000 sq. ft.
Rated Daily Capacity: 400 tons
Process: 3-layer (awn)
Panel Sizes: Cut from 6x12 and 5x8
Percent Into Cut-Up Sizes: 10%
Thicknesses: 3/8" up to 1-3/16"
Raw Material Used: Pine
Volume (from logs): 500 tons
Spec. Gravity: 45# Density
Colors: Natural
Trade Name: Formico Supercore Flakeboard
Uses: Decorative underlayment.
Characteristics: High strength, excellent machinability, minimum telegraphing.
Percent of Product for Own Use: 10%
Specialty Items: Core stock, underlayment, cut-to-size, paper or plastic overlay.
Sales Agents: Formica Corp.

FORREST INDUSTRIES, INC.
Home Address: P. O. Box 78, Dillard, Ore.
Plant Address: Dillard, Ore.
Personnel: William F. Forrest, pres.; Ralph G. DeMaisy, gen. mgr.; Ranald G. Frashour, plant mgr.; William Honey, sales mgr.; Frank E. Kern, supt.; Leland Stadig, plant engr.
Production: (Rated Annual Capacity) 50,000,000 sq. ft. 3/8" basis.
1962 Production: 43,500,000 sq. ft.
Rated Daily Capacity: 150 tons
Process: Particle type homogenous
Panel Sizes: 4x8 primarily; 4x9 to 4x12 edge glued.
Percent Into Cut-Up Sizes: 15%
Thicknesses: 1/4, 5/16, 3/8, 1/2, 5/8, 3/4, 1 inches.
Raw Materials Used: Douglas fir
Volume (mill residues): 50,000 tons annually.
Spec. Gravity: 0.64, 0.67, 0.72, 0.77, 0.88, 0.93
Colors: Natural and Kashmir Walnut
Trade Names: Par-wood, Par-tex, Par-tile, Par-delux, Partex 3-D siding, IRB Quick Strip Floor, Shantong, Striated, Cascade.
Uses: Underlayment, siding, cabinets, core stock, soffits, sheathing, flooring, grain printing, decorative paneling, fencings.
Characteristics: Homogenous composition and density throughout thickness.
Percent of Product for Own Use: 20%
Specialty Items: Core stock, furniture stock, underlayment, cut-to-size, veneer overlay, cabinet stock, prefinish, prefill & primed, floor tile, construction, sheathing, decorative, ceiling tile, embossed IRB (insect repellent board) all particleboard products, Par-Tex (exterior siding), 3-D (vertical grooved panel siding)
Sales Agents: Plywood Service, Inc., Dillard, Ore.

GEORGIA-PACIFIC CORPORATION
Crossett Division—Lumber
Home Address: Equitable Bldg., Portland, Ore.
Plant Address: Crossett, Arkansas
Personnel: R. B. Pamplin, pres.; R. O. Nason, mgr.; R. J. DuChaine, supt.; W. R. Purifoy, sales mgr.; T. H. Walton, tech. dir.; D. K. Mortensen, plant engr.
Production: (Rated Annual Capacity) 25,000,000 sq. ft. 3/4" basis.
1962 Production: 11,127,000 sq. ft.
Rated Daily Capacity: 100 tons
Process: Medium Density Prepared Shavings board—Behr Process
Panel Sizes: Variable 48, 56 x 192
Thicknesses: 3/8 to 1 1/8
Raw Material Used: Raund Wood—Gum
Spec. Gravity: .68
Colors: Light-white to gray
Trade Names: Crossett Flakeboard
Uses: Core stock, underlayment
Percent of Product for Own Use: None
Specialty Items: Core stock, furniture stock, cut-to-size, cabinet stock, prefill.

GEORGIA-PACIFIC CORPORATION
Home Address: Southern Finance Bldg., Augusta, Ga.
Plant Address: Hallsboro, North Carolina
Personnel: Carl Stelling, mgr.; C. A. Nickolous, supt.; W. L. Tabb, sales mgr.
Production: (Rated Annual Capacity) 3,750,000 sq. ft. 3/4" basis.
Process: Lane Extruded (Modified Miller Hafft)
Percent Into Cut-up Sizes: 100%
Thicknesses: 1/2" to 1 1/8"
Raw Material Used: Tupelo Gum.
Spec. Gravity: 42 lbs.
Colors: Light
Uses: Furniture
Percent of Product for Own Use: None
Specialty Items: Core stock, furniture stock, cut-to-size.

GRAY PRODUCTS COMPANY INC.
Home Address: Waverly, Virginia
Plant Address: Waverly, Virginia
Personnel: Elman T. Gray, pres.; Charles E. Crawford, mgr.; Beverly Neff, supt.; Eugene C. Darsa, sls. mgr.; George W. Doege, tech. dir.
Production: (Rated Annual Capacity) 20,000,000 sq. ft. 3/4" basis.
1962 Production: 17,500,000 sq. ft.
Daily Capacity: 180—Rated, 120—Actual
Process: Miller-Hofft
Panel Sizes: 4'x8' to 5'x10'
Percent Into Cut-Up Sizes: 75%
Thicknesses: 1/2" to 1-3/16"
Raw Material Used: Southern Pine pulpwood & shavings—Urea Resin & Wax Emulsion
Volume (Shavings): 11,500 tons, (Pulpwood) 46,500 tons.
Spec. Gravity: .685 (42.7PCF)

Colors: Neutral
Trade Names: Graco Flakecore—Graco Standard—Graco Underlayment.
Uses: Core stock for veneer and decorative laminates, industrial uses and floor underlayment.
Characteristics: Homogeneous type. Excellent mechanical & physical properties. Double sanded.
Percent of Product for Own Use: None.
Specialty Items: Core stock, furniture stock, underlayment, cut-to-size, cabinet stock, prefinish, prefill, decorative various industrial coatings applied.
Sales Agents: E. J. White—J. D. Winkleblack—T. L. Nestel.

HICKORY MFG. CO.
Home Address: Hickory, N. C.
Plant Address: Hickory, N. C.
Personnel: E. M. Fennell, pres.; J. H. Johnson, vice-pres. & gen. mgr.; J. L. Keever, supt.; M. C. Turbyfill, plant mgr.; Ron Romeo, sales mgr.; Bill Price, plant engr.
Production: (Rated Annual Capacity) 600,000 sq. ft. 3/4" basis.
1962 Production: 594,000 sq. ft.
Rated Daily Capacity: 4½ tons
Process: Batch type
Panel Sizes: 64"x108"
Thicknesses: 7/8"
Raw Material Used: Waste chips from plant
Volume (mill residues): 768 tons annually
Colors: Natural
Percent of Product for Own Use: 55%
Specialty Items: Core stock.

INTERNATIONAL PAPER CO.
Long-Bell Division
Home Address: 220 East 42nd St., New York 17, N.Y.
Plant Address: P.O. Box 1079, Longview, Wash.
Personnel: Lamar M. Fearing, pres.; T. A. Deal, mgr.; J. F. Price, supt.; C. E. Miller, sls. mgr.; A. L. Mottet, tech. dir.; M. P. Kurtz, plant engr.
Production: (Rated Annual Capacity) 20,000,000 sq. ft. 1/4" basis.
Rated Daily Capacity: 50 tons
Process: Flakeboard
Panel Sizes: 4'x8'
Percent Into Cut-Up Sizes: 10%
Thicknesses: 3/32" to 3/4"
Raw Material Used: Core-selected softwoods, overlay-selected hardwood & softwood veneers & flakes.
Spec. Gravity: 0.50 to 1.00
Colors: Natural
Trade Names: Flakewood, Flakewall, Flakelock, Prefinished 210 Ven-O-Wood.
Uses: Decorative wall paneling, cabinets, core stock, furniture, industrial.
Characteristics: Durable, high strength, dimensionally stable, plain & decorative.
Percent of Product for Own Use: 25%
Specialty Items: Core stock, furniture stock, underlayment, cut-to-size, veneer overlay, paper or plastic overlay, cabinet stock, prefinish, construction, decorative, wall paneling, V-groove.
Sales Agents: National company offices.

JASPER-AMERICAN MFG. CO.
Home Address: Henderson, Ky.
Plant Address: Henderson, Ky.
Personnel: Thomas L. Habig, pres.; Robert Golday, mgr.; Dick Lampert, sls. mgr.; H. E. Thyen, tech. dir.
Production (Rated Annual Capacity): 10,500,000 sq. ft. 11/16" basis
1962 Production: 5,500,000 sq. ft.
Rated Daily Capacity: 50 tons
Process: Kreibaum
Percent Into Cut-Up Sizes: 85%
Thicknesses: ½ to 1½ inches
Raw Materials Used: Pine
Volume (mill residues): 10,000 tons annually
Spec. Gravity: .6
Colors: Light
Trade Names: Stylemaster Chipcore
Uses: Plywood cores
Characteristics: Vertically oriented chips
Percent of Product for Own Use: 70%
Specialty Items: Core stock, furniture stock, cut-to-size, veneer overlay, cabinet stock, construction, underlayment, paper or plastic overlay.
Sales Agents: The Jasper Corp., Josper Stylemasters, Inc.

KROEHLER MANUFACTURING CO.
Home Address: Naperville, Ill.
Plant Address: West Station, Meridian, Miss.
Personnel: Kenneth Kroehler, pres.; Fred L. Myers, mgr.; Walter Johnson, supt.; E. J. McFarland, plant engr.
Production: (Rated Annual Capacity) 7,200,000 sq. ft. 3/4" basis.
1962 Production: 2,000,000 sq. ft.
Rated Daily Capacity: 65 tons
Process: Emerite—Platen type
Panel Sizes: 5'x10'
Percent Into Cut-Up Sizes: None
Thicknesses: ½, 5/8, 3/4, 7/8, 1, 1 1/8 inches.
Raw Material Used: Southern hardwood chips
Volume (mill residues): 15,600 tons annually
Spec. Gravity: .67-.88
Colors: Light Brown
Trade Names: Cultured Wood—Chemwood
Uses: Furniture core stock, frame stock, cabinet doors, television cabinet bases, dinette table tops.
Characteristics: Dimensionally stable, excellent screwholding, high internal bond, tight edge.
Percent of Product for Own Use: 80%
Specialty Items: Core stock, furniture stock, cut-to-size, veneer overlay, paper or plastic overlay, cabinet stock.

THE LANE COMPANY, INC.
Home Address: Altavista, Va.
Plant Address: Altavista, Va.
Personnel: E. H. Lane, Sr., Chairman of Board; H. O. Powell, pres.; B. B. Lane, mgr.; F. T. Holland, plant mgr.; Waverly Davidson, tech. dir.; R. T. Blanchard, plant engr.
Production: (Rated Annual Capacity) 12,000,000 sq. ft. 3/4" basis.
1962 Production: 7,000,000 sq. ft.
Rated Daily Capacity: 25 tons
Process: Lanewood Extrusion
Panel Sizes: 48" & cut to length.
Percent Into Cut-Up Sizes: 100%
Thicknesses: 9/16-21/16 inches.
Raw Material Used: Dry mill waste
Volume (mill residues): 7 million ft.; 2.74 lbs./sq. ft.
Spec. Gravity: .65
Trade Name: Lanewood
Uses: Core stock
Characteristics: Extruded
Percent of Product for Own Use: 95%
Specialty Items: Core stock, furniture stock, cut-to-size, veneer overlay, cabinet stock.

LESTER CEDAR PRODUCTS INC.
Home Address: Box 465, Sweet Home, Ore.
Plant Address: Sweet Home, Ore.
Personnel: Mel Lester, pres. & sls. mgr.; Mike Lester, supt. & plant engr.; W. A. Shumate, prod. mgr.
Production: (Rated Annual Capacity) 7,000,000 sq. ft. ½" basis.
1962 Production: 4,000,000 sq. ft.
Rated Daily Capacity: 42 tons
Process: Industrial Developments Inc.
Panel Sizes: 60x120 inches.
Percent Into Cut-Up Sizes: 10%
Thicknesses: 1/4" to 1 1/4"
Raw Material Used: Alder, Maple & Fir
Volume (mill residues): 4000 tons annually; (from logs) 15,000 tons annually.
Spec. Gravity: .65
Colors: Natural
Trade Names: Cedawood—G. P. Flakeboard—Lester Flakeboard
Uses: Cabinet furniture, paneling, punch board, flooring, ceiling tile, etc.
Characteristics: No warp, decorative, excellent machining, good strength and screw holding, high density.
Percent of Product for Own Use: None
Specialty Items: Core stock, furniture stock, underlayment, cabinet stock, floor tile, construction, sheathing, decking, decorative, T&G, V-groove, punch board, fire retardant, termite repellant.

NORTHBOARD INC.
Plant Address: Caspian, Mich.
Home Address: Iron River, Mich.
Personnel: S. A. McCornock, pres., Robert A. Caughey, tech. consultant
Production: To begin production early 1964
Panel Sizes: 4x8 feet
Thicknesses: 3/8" to 3/4"
Raw Material Used: Aspen
Uses: Core stock, underlayment, construction, cabinet stock

NU-WOODS, INC.
Home Address: P.O. Box 706, Lenoir, N.C.
Plant Address: 205 Horrisburg Rd., Lenair, N.C.
Personnel: Harold F. Coffey, pres.; S. D. Weber, gen. & sales mgr.; Fred H. Fulmer, supt.
Production: (Rated Annual Capacity) 6,000,000 sq. ft. 3/4" basis.
1962 Production: 2,512,829 (operated 7 mo.)
Rated Daily Capacity: 36 tons
Process: Miller-Hofft Platten Process
Panel Sizes: 4 x 8 ft.
Percent Into Cut-up Sizes: 50%
Thicknesses: ½, 5/8, 3/4, 7/8 inches.
Raw Material Used: Multi-specie
Volume (mill residues) 36 tons per day.
Spec. Gravity: .65 to .70
Colors: Natural
Trade Names: Ligna Band
Uses: Core stock for furniture
Percent of Product for Own Use: None
Specialty Items: Core stock, furniture stock, cut-to-size.

THE PACK RIVER CO.
(Tenex Inc.)
Home Address: P.O. Box 351, Sandpoint, Idaho
Plant Address: Dover, Idaho
Personnel: L. V. Brown, pres.; T. E. O'Donnell, mgr.; Doug Rude, supt.; T. S. Porter, sales mgr.; D. L. Haynes, tech. dir.

Production: (Rated Annual Capacity) 66,000,000 sq. ft. 1/4" basis.
Rated Daily Capacity: 87 1/2 tons
Process: Own (flakeboard)
Panel Sizes: 4x1 to 4x16 feet
Percent Into Cut-up Sizes: 5%
Thicknesses: 1/4"
Raw Material Used: Wood, resin and wax
Volume (mill residue): 16,200 tons (from logs) 17,500 tons
Spec. Gravity: 0.7
Colors: Natural and seven two-tone combinations
Trade Names: Duo-Tone wall panels and ceiling tiles
Uses: Exterior particleboard
Characteristics: Large flakes throughout
Percent of Product for Own Use: None
Specialty Items: Prefinish, construction, sheathing, decking, decorative

POPE & TALBOT, INC.
Home Address: 100 Bush St., San Francisco, Calif.
Plant Address: Oakridge, Ore.
Personnel: George A. Pope, Jr., pres.; John W. Snyder, mgr.; Robert J. Crawford, supt.; Les Steers, sls. mgr.; Poo Chow, tech. dir.; Frank Foyston, plant engr.
Production (Rated Annual Capacity): 18,000,000 sq. ft. 3/4" basis
1962 Production: 16,189,000 sq. ft.
Rated Daily Capacity: 100 tons
Process: Miller-Hofft
Panel Sizes: Up to 54x120 inches
Percent Into Cut-Up Sizes: 50%
Thicknesses: 1/4 through 1 1/2 inches
Raw Material Used: Flakes—planner mill shavings
Volume (mill residues): 30,000 tons annually (from logs) 5,000 tons annually.
Spec. Gravity: 0.55 to 0.80
Colors: Natural, red, green, violet, brown.
Trade Names: Custom-Bond, Custom-Blend, Custom-Flake, Custom-Base
Uses: Furniture, cabinets, sink & countertops, displays, partitions, doors, underlayment, floor tile, siding, paneling, veneer overlay.
Percent of Product for Own Use: None
Specialty Items: Core stock, furniture stock, underlayment, cut-to-size, cabinet stock, prefill, construction, decorative, V-groove, T & G.

ROCK ISLAND MILLWORK CO.
Home Address: 2525—4th Ave., Rock Island, Ill.
Plant Address: Rock Island, Ill.
Personnel: E. R. Titcomb, pres.; George LeClerc, mgr.; David Haile, supt.; James Bell, sales mgr.; Leonard Ropella, tech. dir.; Ralph Crespin, plant engr.
Production: (Rated Annual Capacity) 30,000,000 sq. ft. 1/8" basis.
1962 Production: 28,532.000 sq. ft.
Rated Daily Capacity: 50 tons
Process: Own—Multi-platen
Panel Sizes: 49 1/2x98, 50x98 inches.
Percent Into Cut-Up Sizes: 10%
Thicknesses: 3/16, 9/32, 3/8, 1/2 inches
Raw Material Used: Ponderosa Pine residue
Volume (mill residue): 10,000 tons annually.
Spec. Gravity: 1.0
Colors: Light tan
Trade Names, Resinwood, Resincore
Uses: Core for plastic overlay, benches, toys, etc.
Characteristics: High bonding strength, good edge machining and finishing.
Percent of Product for Own Use: 5%
Specialty Items: Core stock, furniture stock, cut-to-size
Sales Agent: George Pierce

SOUTHERN PINE LUMBER CO.
Home Address: Diboll, Texas
Plant Address: Pineland, Texas
Personnel: Arthur Temple, Jr., pres.; J. W. Sweeny, gen. mgr., Pineland Operation; B. E. Mikulka, project tech. dir.; R. E. Howard, prod. supervisor; F. D. Johnson, quality supervisor; John O. Booker, project engr.
Production: (Rated Annual Capacity) 8,000,000 sq. ft. 1/4" basis.
1962 Production: None
Rated Daily Capacity: 50 tons in First Stage.
Process: SPLCo—Fibrexa S.A.
Panel Sizes: Up to 5x18 ft.
Percent Into Cut-up Sizes: Est. 30%
Thicknesses: 1/4" to 3"
Raw Material Used: Pine pulpwood and pine & oak shavings.
Volume (mill residues) 7,000 tons. (from logs) 7,000 tons.
Spec. Gravity: .3 to .9
Characteristics: Smooth surface, stable three layer construction splinter or flake type board.
Percent of Product for Own Use: 30-60%
Specialty Items: Core stock, furniture stock, underlayment, cut-to-size, cabinet stock, prefill, construction, fully machined furniture parts.

SOUTHERN PLASWOOD CORP.
Affiliate of Emerite Corp., Jackson, Miss.
Home Address: Box 123, Hope, Ark.
Plant Address: Hope, Ark.
Personnel: R. W. Emerson, pres. & tech. dir.; Gordon Bayless, mgr.; S. D. Camper, Jr., sales mgr.
Production (Rated Annual Capacity): 15,000,000 sq. ft. 3/4" basis.
1962 Production: 12,000,000 sq. ft.
Rated Daily Capacity: 54 tons
Process: Emerite Chemical Binder
Panel Sizes: 48x96 and 48x144
Percent Into Cut-Up Sizes: 55%
Thicknesses: 1/2, 11/16, 3/4, 1 inch.
Raw Materials Used: Pine shavings.
Volume (mill residues): 16,000 tons annually
Spec. Gravity: 80 to 1
Colors: Natural pine
Trade Names: Korstok, Chemwood
Uses: Furniture core, underlayment, dinette core, panel stock.
Characteristics: Flat, homogenous panels, good machineability & internal bond. Extremely stable.
Percent of Product for Own Use: None
Specialty Items: Core stock, furniture stock, underlayment, cut-to-size, cabinet stock, construction, sheathing, decking, lumber banded stock, 1, 2, 3, or 4 bonds, patented filling process to make possible printing.
Sales Agents in: Chicago, St. Louis, Louisville, Greensboro, New York, Jamestown, Grand Rapids, Dallas, Ft. Smith, Milwaukee, Atlanta and Jackson, Miss.

STANDARD BOARD PRODUCTS INC.
Plant Address: Route 1, Box 3364, Sweet Home, Ore.
Personnel: Warren Gill, pres.; Ed Kellenberger, gen. & sales mgr.; Gayle Pulver, supt.; Ray Speck, tech. dir.; Louis V. Schuldt, plant engr.
Production: (Rated Annual Capacity): 24,000,000 sq. ft. 3/8" basis.
Process: Mat formed
Panel Sizes: 4x8 ft.
Percent Into Cut-up Sizes: None
Raw Material Used: Green planer shavings
Volume: Began operation in 1963
Spec. Gravity: .68
Trade Names: Standbo and Westwood
Uses: Underlayment
Specialty Items: Underlayment, construction, sheathing, decking.

STORKLINE CORPORATION
Home Address: P. O. Box 492, Jackson, Miss.
Plant Address: Livingston Rd., Jackson, Miss.
Personnel: C. B. Ryan, pres.; G. F. Bracken, vice-pres. manufacturing; W. M. Taylor, vice-pres. sls.; M. R. Zoercher, sls. mgr.; John E. Griffith, tech. dir.; G. H. Robinson, plant engr.
Production: (Rated Annual Capacity) 2,080,000 sq. ft. 7/8" basis.
1962 Production: 906,000 sq. ft.
Rated Daily Capacity: 11.2 tons (1 shift)
Process: Own—Multi-platen
Panel Sizes: 4x8
Percent Into Cut-Up Sizes: 100%
Thicknesses: 7/8 inches
Raw Material Used: Southern hardwoods
Volume (mill residues): 1,300 tons annually
Spec. Gravity: .7
Colors: Natural
Trade Name: Nu-Tex
Uses: Core stock
Percent of Product for Own Use: 100%
Specialty Items: Core stock, furniture stock, veneer overlay, cabinet stock, cut-to-size.

***SUPERWOOD MULTIPLY PLANT**
Home Address: 14th Ave. West & Waterfront, Duluth, Minn.
Plant Address: Virginia, Minn.
Personnel: M. J. Opsahl, pres.; Ray Krause, supt.; R. L. Stephany, sls. mgr.; Lennart Egerstrand, tech. dir.
Production (Rated Annual Capacity): 12,000,000 sq. ft. 3/4" basis.
1961 Production: 3,000,000 sq. ft.
Rated Daily Capacity: 38 tons daily
Process: Chapman flakeboard with fibre overlay
Panel Sizes: 4x8 ft.
Thicknesses: 5/8, 3/4 inches
Raw Materials Used: Aspen
Volume (from logs): 12,000 tons annually
Spec. Gravity: .75
Colors: Natural tan
Trade Name: Superwood Multiply Board
Uses: Underlayer, sheathing and general construction
Percent of Product for Own Use: None
Specialty Items: Underlayment, veneer overlay, paper or plastic overlay, cabinet stock, construction, sheathing, decking.

***SWAIN INDUSTRIES INC.**
Home Address: West Second St., Seymour, Ind.
Plant Address: Seymour, Ind.
Personnel: F. W. Bottorff, pres.; D. Billings Swain, vice-pres.; Paul Aikman, supt.; L. C. Moore, sec.; L. J. Heyne, treas.
Production: (Rated Annual Capacity) 10,000,000 sq. ft. 1/2" basis.
Process: Own
Panel Sizes: 30x108, 30x115, 36x108, 36x115, 48x96.
Thicknesses: 1/4, 3/8, 1/2, 5/8, 3/4 inches.
Row Materiol Used: Mixed hardwoods
Lbs./Cu.Ft.: 42, 45, 48
Trade Name: Trimwood
Uses: Chair backs, seats, panel corestock.

Characteristics: Sold sanded in sheets, cut-to-size, or shaped to customer's pattern.
Percent of Product for Own Use: None
Specialty Items: Core stock, cut-to-size, veneer overlay, chair seats & backs.
Sales Agents: Illinois Fibre & Specialty Co., Chicago, Ill.; Smith & Greenwood, High Point, N. C.; Stanley V. Taylor, Seymour, Ind.

TENN-FLAKE CORP.
Home Address: P. O. Box 106, Morristown, Tenn.
Plant Address: Trade Street, Morristown, Tenn.
Personnel: Lester Popkin, pres.; Arthur H. Haigh, Jr., mgr.; Arthur Marburg, sales mgr.
Production: (Rated Annual Capacity) 10,000,000 sq. ft. 3/4" basis.
1962 Production: 7,000,000 sq. ft.
Rated Daily Capacity: 40-45 tons
Process: Bison System
Panel Sizes: 5'x20', 5x8', 5x10', 5x12'
Thicknesses: 3/8—1 inches
Raw Material Used: Poplar, maple, pine ond gum.
Volume (from logs): All
Spec. Gravity: .68
Trade Name: Tenn-Flake
Uses: Core material for plywood and plastic lamination, shelvings, cabinets, tables, displays.
Characteristics: Multi-layer interlocking layers, wide belt sanded, smooth 2 sides.
Percent of Product for Own Use: None
Specialty Items: Core stock, furniture stock, cut-to-size, cabinet stock, decking, formed products.

UNITED STATES PLYWOOD CORP.
Home Address: 55 West 44th St., (New York Office; H. B. Miller,
Plant Address: P. O. Box 1688, Redding, Calif.
Personnel: S. W. Antoville, Chmn. of Bd.; Gene C. Brewer, pres.; (New York Office); H. B. Miller, gen. mgr.; W. C. Smith, mgr. Particle Board Operations; D. N. McClary, prod. mgr.; M. Fuller and B. Cox, supts.; L. H. Boudreau, sls. mgr.; R. Kamrath, tech. dir.; V. E. Daniels, plant engr.
Production (Rated Annual Capacity): 120,000,000 sq. ft. 3/8" basis.
1962 Production: 76,816,000 sq. ft.
Process: Novaply 3-ply
Panel Sizes: 6x12 and 4x16 feet
Percent Into Cut-Up Sizes: 65%
Thicknesses: 3/8" thru 1 3/4" inclusive
Raw Materials Used: Douglas fir; White fir; Ponderosa pine; Southern pine chips for core; Douglas fir peeler cores for face shavings.
Volume (mill residues) 43,100 tons annually; Volume (from logs) 10,800 tons annually
Spec. Gravity: .62 to .71 (lower densities in panels over 1 1/4" thickness.
Colors: Douglas fir shavings color
Trade Name: Novoply
Uses: Building construction (interior); sliding doors; folding doors, wall paneling, single wall partitions, furniture (as core stock and natural); sinks, desks, underlayment.
Characteristics: Attractive mosaic surface appearance; very flat—warp free; high strength, water resistant. Also ideal as core stock without crossbanding. Many uses overlaid one side only.
Specialty Items: Core stock, furniture stock; underlayment, cut-to-size; veneer overlay, cabinet stock; prefinish, prefill, decorarotive; machined sink deck cores; sliding and bifold doors; edge banded furniture cores and solid core door cores.
Sales Agents: United States Plywood Corp. Branch Warehouses.

UNITED STATES PLYWOOD CORP.
Home Address: 55 West 44th St., New York, N. Y.
Plant Address: P. O. Box 108, South Boston, Va.
Personnel: S. W. Antoville, chmn. of bd.; Gene C. Brewer, pres.; (New York office); Warren C. Smith, mgr. Particle Board Operations; R. M. Baily, res. mgr.; Neal Beatty, supt.; J. A. Ferrier, plant sls. mgr.; Robert Bremhorst, sls. mgr. (N.Y.); Ramsey Frank, tech. dir.; Edward H. Morse, plant engr.
Production: (Rated Annual Capacity) 80,000,000 sq. ft. 3/8" basis.
1962 Production: 48,295,000 sq. ft.
Rated Daily Capacity: 164 tons
Process: Novoply
Panel Sizes: 5x16 feet
Percent Into Cut-Up Sizes: 80%
Thicknesses: 5/16 to 1-5/16 inches
Raw Material Used: Pine and soft hardwoods.
Volume (from logs): 60,000 cords pulpwood/year.
Spec. Gravity: .700
Colors: Southern Pine flake color.
Trade Name: Novoply
Uses: Building construction (interior), sliding doors, folding doors, wall paneling, single wall partitions, furniture (as core stock and natural), sinks, desks.
Characteristics: Attractive mosaic surface appearance, very flat, warp free, high strength, water resistant. Also ideal as core stock without crossbanding. Many uses overlaid one side only.
Percent of Product for Own Use: None
Specialty Items: Core stock, furniture stock, cut-to-size, cabinet stock, prefill, decorative, simple machining.
Sales Agents: United States Plywood Corp. Branch Warehouses.

VIKO FURNITURE CORP.
Home Address: T. Baumritten Corp., New York, N.Y.
Plant Address: Eldred, Pa.
Production: (Rated Annual Capacity) 1,500,000 sq. ft. 5/8" basis.
1962 Production: 500,000 sq. ft.
Process: Kreibaum
Thicknesses: 5/8 inches
Spec. Gravity: 40
Colors: Natural
Uses: Core
Percent of Product for Own Use: 100%
Specialty Items: Care Stock

WESTERN PANEL, INC.
Home Address: 1400—18th Ave., Sweet Home, Ore.
Plant Address: Sweet Home, Ore.
Personnel: W. Allen Wodtli, mgr. & sls. mgr.
Production: (Rated Annual Capacity) 6,000,000 sq. ft. 5/8" basis.
Process: Chapman
Panel Sizes: 48x96 inches
Thicknesses: 1/4, 3/8, 1/2 5/8, 3/4 inches
Raw Material Used: Shavings
Spec. Gravity: 0.7
Trade Name: Linn Wood
Specialty Items: Underlayment, paper or plastic overlay, cabinet stock, sheathing, decorative.

WEST VIRGINIA PULP & PAPER CO.
Home Address: 230 Park Ave., New York, N. Y.
Plant Address: Pennsylvania Ave., Tyrone, Pa.
Personnel: Dovid L. Luke, III, pres.; J. Lynne Ferner, mgr.; John A. Churchill, supt.; John W. Holdsworth, sls. mgr.; Charles R. Morschauser, tech. dir.; John H. Crist, plant engr.
Production (Rated Annual Capacity): 20,000,000 sq. ft. 3/4" basis
1962 Production: 15,304,000 sq. ft.
Process: Westvaco—Miller-Hofft
Panel Sizes: 4x8 and cut-to-size
Percent Into Cut-Up Sizes: 25%
Thicknesses: 3/8 to 1 1/8 inches
Raw Material Used: Aspen logs
Volume (from logs): 25,000 tons annually
Spec. Gravity: .63
Colors: White
Trade Names: Westvaco Flokeboard, Westvaco Dureen
Uses: Kitchen cabinets, furniture, core stocks, plastic fabrications, store displays, wall partitions.
Characteristics: Tight edges, light color, high MOR and MOE
Percent of Product for Own Use: None
Specialty Items: Core stock, furniture stock, cut-to-size veneer overlay, paper or plastic overlay, cabinet stock, decorative, hardboard overlays.

WEYERHAEUSER COMPANY
Wood Products Division
Home Address: Tacoma Bldg., Tacoma, Wosh.
Plant Address: Arcata, Calif.
Personnel: Norton Clapp, pres.; R. D. Pauley, mgr. Manufactured Panel Products; Robert E. Johnson, br. mgr.; J. C. Wallenstrom, national sales mgr.; George B. Matter, Manufactured Panels tech. dir.
Production (Rated Annual Capacity): 27,000,000 sq. ft. 3/4" basis.
Rated Daily Capacity: 125 tons.
Process: Behr system of flake-panel production.
Panel Sizes: Widths of 51-3/16" to length of 196"
Percent Into Cut-Up Sizes: 50%
Thicknesses: 3/8 to 1 3/8 inches
Raw Materials Used: Douglas fir flakes
Volume (mill residues): 63,000 tons annually
Spec. Gravity: 0.65
Colors: Light tan
Trade Name: Timblend
Uses: Core stock, fixtures, paneling. Line includes regular, filled, veneered, phenolic bonded, acrylic overloid, high-density Kimpreg overlaid, fire-retardant treated and toxic treated.
Characteristics: High strength, resists warping, exceptional edge-gluing strength, excellent machining and sawing characteristics, extreme compactness and smoothness of edges. Engineered wood flake panels.
Percent of Product for Own Use: 2%
Specialty Items: Core stock, furniture stock, veneer overlay, prefilled & sealed, decorotive, fire-retardant treated, termite resistant treated, phenolic for exterior applications.
Sales Agents: The Weyerhaeuser sales organization, including distribution centers nationwide and independent distributors.

WEYERHAEUSER COMPANY,
Wood Products Division
Home Address: Tacoma Bldg., Tacoma, Wash.
Plant Address: Coos Bay, Ore.

Personnel: Norton Clapp, pres.; R. D. Pauley, Mgr. Manufactured Panel Products; Howard E. Hunt, br. mgr.; J. C. Wallenstrom, National sales mgr.; George B. Matter, Manufactured Panels tech. dir.
Production: (Rated Annual Capacity) 20,000,000 sq. ft. 3/4" basis.
Process: Miller-Hofft Multi-platen
Panel Sizes: 4'x8'; also larger sizes by edge gluing.
Thicknesses: 3/8, 1/2, 5/8, 3/4 inches.
Raw Material Used: Green shavings
Spec. Gravity: .65
Colors: Light tan
Trade Name: Versabord
Uses: Floor underlayment, core stock.
Characteristics: Uniform thickness, fastens firmly, resists indentation uniform density, good surface for bonding.
Percent of Product for Own Use: None
Specialty Items: Edge-Loc Versabord in sizes larger than 4' x8'.
Sales Agents: The Weyerhaeuser sales organization, including distribution centers nationwide and independent distributors.

WOODCORE, INC.
Home Address: P.O. Box 45, Scottdale, Pa.
Plant Address: Scottdale, Pa.
Personnel: Irving L. Halsted, pres.; Kenton J. Halsted, mgr.; Albert H. Locher, tech. dir.
Production: (Rated Annual Capacity) 3,500,000 sq. ft. 3/4" basis.
1962 Production: 100,000 sq. ft.
Rated Daily Capacity: 15 tons
Process: Chipcraft Extrusion
Panel Sizes: 4' wide up to 12' long
Percent Into Cut-Up Sizes: None
Thicknesses: 1/2"-1 1/4"
Raw Material Used: Oak-Maple
Volume (mill residues): 150 tons
Spec. Gravity: 40-45-50
Colors: Light brown
Trade Name: ScotBord
Uses: Core stock, underlay
Characteristics: Hardwood extruded
Percent of Product for Own Use: none
Specialty Items: Core stock, furniture stock, underlayment, cut-to-size, veneer overlay, cabinet stock, lumber edge banded.

WYNNEWOOD PRODUCTS CO.
Home Address: P. O. Box 8105, Dallas, Texas.
Plant Address: 303 Tena St., Jacksonville, Texas.
Personnel: Burwell J. Thompson, pres.; K. N. Stordalen, vice-pres. & gen. mgr.; R. R. Bridges, supt. & tech. dir.; Delbert Cummins, plant engr.; Earl H. Williams, sls. mgr. So. Territory
Production: (Rated Annual Capacity) 12,000,000 sq. ft. 3/4" basis.
1962 Production: 9,000,000 sq. ft.
Rated Daily Capacity: 60 tons
Process: Platen
Panel Sizes: 4'x8'
Percent Into Cut-Up Sizes: 90%
Thicknesses: 3/8" thru 1 3/4"
Raw Material Used: Southern Pine shavings
Volume (mill residues): 50,000 tons
Spec. Gravity: Corstoc .717; Arcatex .894; WW601 1.01; WW60F .977; Dorcor .560; Finecor .752
Colors: Light
Trade Names: Wynnewood Corstoc, Arcatex, Finecor, Dorcor, 601, 60F.
Uses: Furniture, solid core doors, partitions, church & school furniture.
Characteristics: Six types designed for particular end uses.
Percent of Product for Own Use: None
Specialty Items: Core stock, furniture, stock, cut-to-size, cabinet stock, doors, partitions, edge banding.
Sales Agents: L-M Forest Products, Grand Rapids, Mich.; R. E. Laube, Sherman Oats.

Source: Forest Industries, July 1963

Appendix 7 (continued)

SUPPLEMENTARY LIST OF ACTIVE WOOD PARTICLEBOARD PLANTS
IN THE UNITED STATES, 1964

CALDWELL FURNITURE CO.
Plant Address: Lenoir, N. C.
Process: Lane horizontal extrusion
Product: Splinter-type particleboard
Density: Medium
Thickness: 3/4"
Panel Size: 49" wide, any standard panel length
Raw Material: Furniture plant waste
Rated Annual Capacity: 5 million sq. ft. 3/4" basis
Rated Daily Capacity: 40 tons
Press Capacity: 1 extrusion press
Captive Plant

HART WOOD PRODUCTS
Home Address: Hart, Michigan
Plant Address: Box 27, Hart, Mich.
Personnel: W. L. Tate, President and Manager
Rated Annual Capacity: 3 million sq. ft. 3/4" basis
Product: Splinter board
Process: Extrusion
Captive Plant

LENOIR CHAIR COMPANY
Plant Address: Newton, N. C.
LENOIR FURNITURE CORP.
Plant Address: Lenoir, N. C.
(Duplicate operations -- single plant listed below)
Personnel: C. E. Beach, Manager
Process: Lane-Adamson horizontal extrusion
Product: Splinter-type particleboard
Density: Medium
Thickness: 11/16" to 1 5/16"
Panel Size: 48" wide, any standard panel length
Raw Material: Furniture plant waste, mostly hardwood
Rated Annual Capacity: 5 million sq. ft. 3/4" basis
Rated Daily Capacity: 40 tons
Press Capacity: 1 extrusion press (each plant)
Two Captive Plants

POINSETT LUMBER & MFG. CO.
(The Singer Mfg. Co.)
Home Address: Trumann, Ark.
Plant Address: Trumann, Ark.
Process: Multi-platen
Rated Annual Capacity: 5 million sq. ft. 3/4" basis
Captive Plant

POTLATCH FORESTS, INC.
Bradley-Southern Division
Plant Address: Warren, Arkansas

ROCK ISLAND CORP.
Home Address: 2525 4th Ave., Rock Island, Ill.
Plant Address: Marinette, Wisc.
Personnel: E. R. Titcomb, President
Rated Annual Capacity: 15 million sq. ft. 3/4" basis
Process: Multi-platen
Raw Material: Aspen
Volume: 35,000 cords annually
Specific Gravity: 1:0
Trade Name: Resincore
Date of Completion: 1964 or 1965

THOMASON CHIPBOARD CO.
Plant Address: Fayetteville, N. C.
Personnel: J. A. Barnes, Manager; B. H. Thomason, President
Process: Chipcraft vertical extrusion
Product: Splinter-type particleboard
Density: Medium
Thickness: 1 1/8" to 1 9/16"
Panel Size: 48" wide, any standard panel length
Raw Material: Softwoods and hardwoods, mill residues, veneer waste
Rated Annual Capacity: 4 million sq. ft. 3/4" basis
Rated Daily Capacity: 30 tons
Press Capacity: 1 extrusion press
Captive Plant

UNITED STATES PLYWOOD CORP.
Home Address: 55 West 44th St., New York, N. Y.
Plant Address: Gaylord, Mich.
Process: Novoply
Rated Annual Capacity: 40 million sq. ft. 3/4" basis
Scheduled for Production: Spring, 1965

WEST VIRGINIA FOREST PRODUCTS CO.
Home Address: P. O. Box 426, Greenville, S. C.
Plant Address: Sutton (Braxton County), West Virginia

WILLIAMS FURNITURE CORP.
Home Address: P. O. Box 631, Sumter, S. C.
Plant Address: Fulton & Grant Sts., Sumter, S. C.
Captive Plant

WOOD FIBREBOARD CO.
Home Address: 326 Pacific Building, Portland, Oregon
Plant Address: Old Pacific Highway, P. O. Box 245, Albany, Oregon
Personnel: William Swindles, President